





THE AEROPLANE

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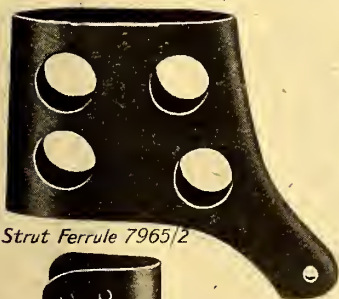
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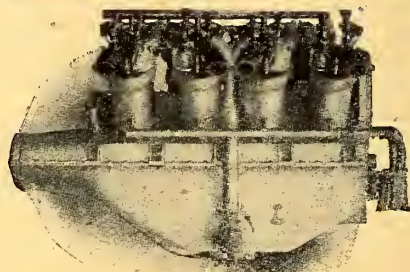
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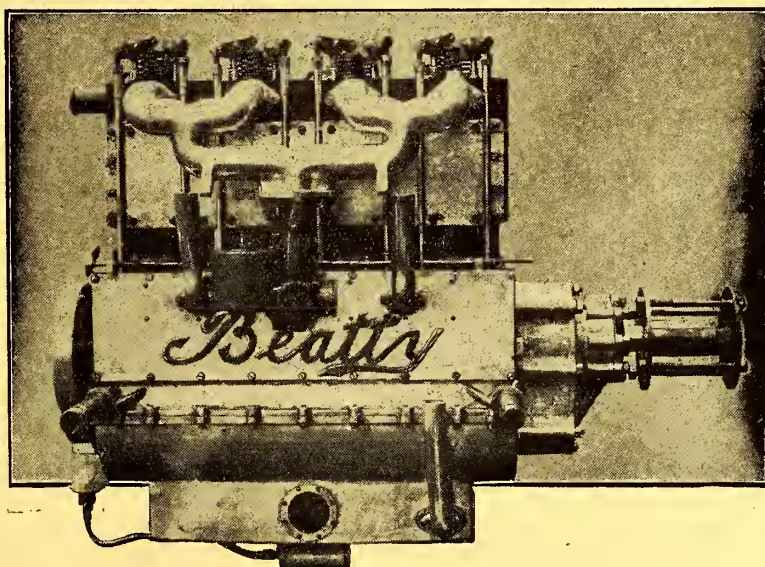
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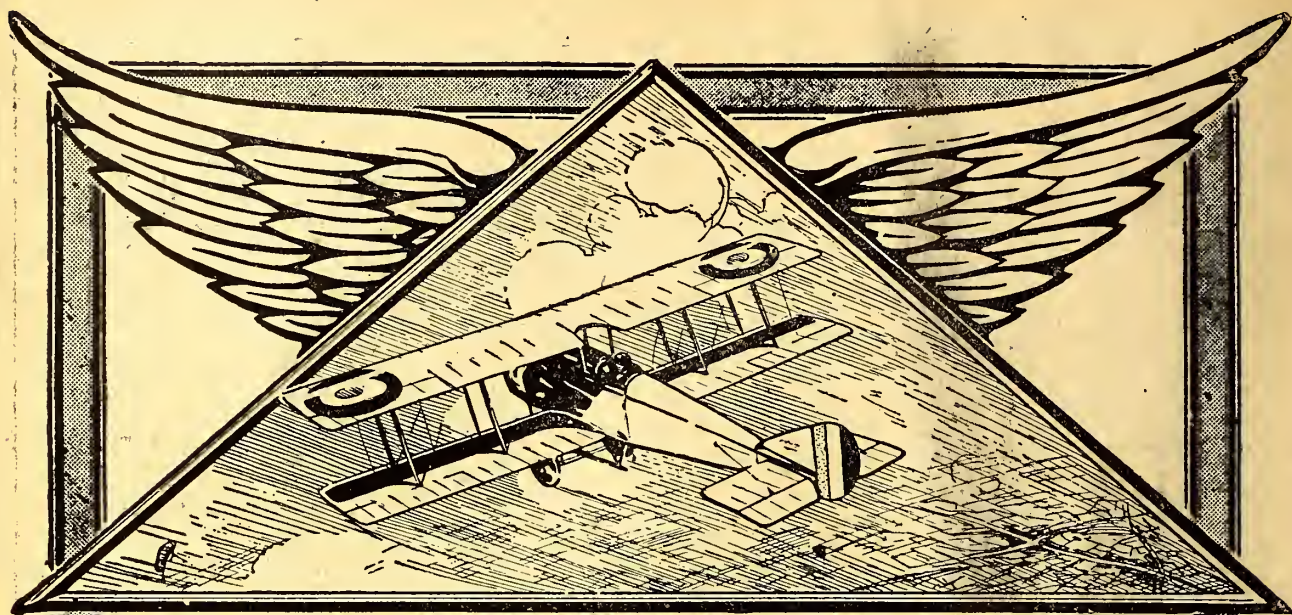
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ON TRYING EXPERIMENTS.

On March 29th, the Ministry of Munitions issued an order with regard to the experimental manufacture of aeroplanes, which provides that:

(1) On and after the 1st day of April, 1917, no person shall, without a licence from the Minister of Munitions, commence or proceed with the experimental manufacture of any aeroplane or seaplane or any part thereof other than any kind of aero-engine. Provided that where a first application for a licence under this Order shall have been made, and is pending for the carrying on of any experimental manufacture which shall have been commenced before the said 1st day of April, 1917, nothing in this Order shall prohibit the carrying on of such manufacture until the licence shall have been refused.

(2) The term experimental manufacture shall mean any manufacture which is not under or for the direct purpose of fulfilling a Government contract, and shall include the preparation of any working drawings, but not the preparation of general arrangement drawings.

(3) All persons desirous of obtaining licences to commence or carry on any such experimental manufacture as aforesaid shall apply in writing to the Controller of Aeronautical Supplies, Air Board Office, London, W.C.2, for such licence, and shall give full particulars of the manufacture for which the licence is required, and shall comply with any restrictions or conditions subject to which the grant of such licence may be made.

A presumably official explanation of the order says: "The Order is not intended to prevent and discourage the design of new machines, but only to prevent useless expenditure of labour and materials upon designs and machines which have no prospect of success. The Department desires to give every possible encouragement to original design, and no obstacle will be placed in the way of any persons where there is any reasonable likelihood of their being able to produce a useful design."

Taken as it stands, the new order has much to commend it. It will be obvious to the most limited intelligence—say, for example, the average intelligence of the late Government as demonstrated by the Dardanelles Commission—that all and sundry cannot be permitted to expend material and man-power on crazy experiments with aeroplanes designed by people who have had no really practical experience.

To the individual who has struck what seems to him a brilliant idea, and who has persuaded someone possessed of the necessary wealth that the idea is worth financing, the order may seem unreasonable. It is comparatively easy to obtain money for aircraft ventures in these days, when everything aeronautical is booming. It is easy enough to find labour if one knows how. And material can be got also with a little skill and with sufficient money.

Therefore the enthusiastic designer may well feel himself ill-used if he is to be prevented from developing what he believes to be the idea of the century.

One hears a great deal about shortage of material and labour, and so one is apt to think that there is a famine in the land as concerns these commodities. As a matter of fact, there never has been a time when both were so plentiful. Labour is particularly plentiful, now that aircraft factories are so excellent a protection against going into the trenches. The shortage is, in fact, caused by the demand being so much greater than the supply, which is rather a different thing. The would-be revolutioniser of aeroplane design knows this, and is aggrieved because he cannot have the small amount of labour and material required for his experiments.

THE ACCURSED INVENTOR.

His attitude in such a case is rather like that of the Irishman who went to look for a job. Being rather an agreeable person, the works foreman was civil to him, and explained that he quite appreciated all his excellent qualities and would very much like to give him a job, but the shop already had all the hands it wanted, and there was simply no work for him to do. "Ah, well, what's the odds?" said Pat. "Sure, the little bit o' work I'd do 'ld make no differ."

I myself am constantly receiving letters—such long, long letters—from inventors and designers who cannot understand why their brilliant ideas are not promptly adopted by the authorities, and only too frequently I suffer calls—such long, long calls, just when I am busiest—from people with similar grievances. And in at least nine cases out of ten their epoch-making inventions are as ancient as flying itself, and sometimes older still, or else they are obviously futile.

So much am I afflicted by inventors that I quite sympathise with those much-abused officials who regard all inventors as mad and all inventions as waste of time. These officials must feel actual physical nausea every time they open a package containing the vast array of documents which every inventor inflicts on those who consent to read or listen to him, and it must need a distinct effort of will-power on their part to prevent themselves from throwing the lot into the waste-paper basket.

Apart from minor improvements or alterations in detail design, sent in by people who know their jobs, I doubt whether one per cent. of inventions submitted are of any value at all, and it would be fairly safe to say that not one in a thousand is of such outstanding merit as to cause a revolution in its own line of business. Even where detail alterations or improvements are concerned, clever as many of them are, it is almost always difficult to say whether the advantages they would confer would compensate for the expense in labour and material of substituting them for existing types.

CONCRETE EXAMPLES.

For instance, I have seen comparatively recently some excellent designs for fuselage clips, certainly simpler and cheaper than most of those now in use; but if calculations were made as to the cost of new tools, new jigs, new drawings for complete fuselages, and the re-education of fuselage erectors, and if one added thereto the cost of scrapping old tools, and old jigs, and partly finished parts, it is very doubtful whether the change would pay. Similar considerations apply to all sorts of clever inventions, such as improved detail design of control gears, or of engines, or of any integral part of an aeroplane, as distinct from pure accessories which can be stuck on outside, or fitted inside, without interfering with general designs.

When one comes to consider complete aeroplanes, the position is actually rather more simple. Existing aeroplanes have certain definite performances. If a new aeroplane is to be of any use, it must beat those performances—in its own class, of course. If it does not beat those performances, it is not worth making.

PURE PERFORMANCE.

Provided that a machine is safe to fly, and provided that the pilot can see out of it reasonably well, the only thing that counts for war purposes is performance. And in war-time there is no material or labour to spare for experiments on machines which may have commercial value after the war.

A designer might have a particularly pretty design for a machine which does 100 miles an hour and climbs 1,000 feet in the first minute, but such a machine would not be worth building in these days. The only circumstances under which it would be worth building would be if it could be produced very cheaply, with a cheap and low-powered engine, so that it would be of value as an advanced training machine, on which pupils could gain experience in cross-country flying at small cost in case of smashes, and with small consumption of petrol.

On the other hand, if a designer could reasonably show that his design would produce a machine capable of doing 150 miles an hour at 10,000 feet, and that it could reach that height with full war load in anything under eight minutes, it would be very well worth building. Or if a new design promised to transport five tons of bombs with ten hours' fuel, at a reasonable altitude, at a speed approximating to 100 miles an hour, it would be worth building, despite the enormous cost.

USELESS EXPERIMENTAL TYPES.

The kind of experiment to be sat upon at once is that which costs much money (otherwise time, labour, and material) without definite certainty of success. For example, there are certain people who are always trying to produce direct-lift machines. Goodness knows how many thousands of pounds have been spent already on such experiments.

There is no particular difficulty with modern engines in making a direct-lift machine with vertical screws, but these delightful inventors never seem to have any very clear idea as to how they are going to get down if their

engine, or other part of their mechanism, goes out of action, nor of how they are going to navigate when they are once off the ground. Horizontal speed and direction does not seem to trouble them. They have great ideas on bomb-dropping from a machine which can hover vertically over its mark, seemingly regardless of search-lights and anti-aircraft guns, but they are hazy as to how to get there, and they ignore the accuracy of modern bomb-sights.

Another frequent class of inventor is the gentleman who wants to blow air up against his wings, so as to get a direct thrust down from the said wings, and so achieve vertical lift or forward propulsion as he may desire.

All of them forget that a modern aeroplane gets off the ground with a shorter relative run than that of any bird, and that a modern propeller gives enormously high efficiency, calculating from the known power of the engine and the actual work done in conveying and lifting known weights.

Any improvement in this direction must come by way of simplification, as between the British thermal units in the fuel tank and the application of the latent power therein to the air. Improvement cannot come by complication. And any stoppage of waste on experiments in complicated mechanisms is wholly to be commended.

THE NIGGER IN THE WOOD PILE.

There is, however, the inevitable snag in the new order, and against this snag the Air Board will do well to take very careful precautions. That is the fact that under the new order there is a danger of resurrecting the old trouble of the judge of a design being also a competitor with the designer.

It would not be very far wide of the mark if one said that every new type of aeroplane which has had a notably good effect in the war has been produced in spite of, and not because of, the judgment of official theorists, scientists, and "experts" generally. One or two notably valuable machines have been produced practically in defiance of official instructions, and others have been built quietly round the corner, so to say, when the local officials were not looking.

Others, again, have been built with official sanction, but only after weeks, and sometimes months, of argument and discussion and string-pulling, and waste of valuable time occupied in overcoming official objections, when that same time might have been better spent in producing war aeroplanes.

At least one manufacturer of immense strength of character adopted from the beginning the principle of building an aeroplane, demonstrating its performance, and saying in effect, "That is what the active-service pilots want. That is what I am going to build. Take it or leave it. And if you leave it, I stop making aeroplanes." And somehow that method of dealing won for him the highest respect.

It is, however, a valid objection to my doubts, thus expressed, to advance that these regrettable incidents occurred before the Advent of the present Air Board.

ON A NEW HEAVEN AND A NEW EARTH.

Gladly would one welcome the Noble Lord who presides over the Air Board as the Messiah of Aviation, and one would rejoice exceedingly to believe that he is come to create a new Heaven and a new Earth, so far as Service aeronautics are concerned. Unfortunately much remains under the Board of the old official system which prevented progress in the past.

One had rather hoped that the combination of the technical departments of the two Services would have

operated somewhat as the combination of the two departments of a Seidlitz-powder function, but, though there appears to have been some physiological effect, the system does not seem to have been effectually cleared. Therefore the Board will do well to assure that the cessation of individual experiments, as indicated by the latest Munitions Order, does not entail an immense recrudescence of official experiments.

There is always the danger that those who have the

power to veto experiments by firms of proved worth may have pet theories of their own which they desire to test. It is not beyond belief that an official who wished to build and try out an experimental aeroplane of his own design might deliberately prevent experiments by a trade firm on lines similar to his own, lest the trade firm's experiments might be carried to a successful conclusion before his own were developed, and so might deprive him of the kudos attaching to a successful innovation.

It has been proved in the past that official experiments take longer and cost more than those carried out under stress of commercial competition, and they are not always as successful. One recalls, for instance, the long series of "S.E." scouts and their small measure of success when compared with the scouts made by purely commercial firms who were not vouchsafed the same advantages in such matters as priority of delivery of engines. One recalls, also, various attempts by official scientists to produce very large aeroplanes, which cost vast wealth in man-power and material and produced a minimum of result compared with what was done by at least two trade firms, acting in collusion with active-service pilots.

Similar comparisons to the disadvantage of official experimenters can be produced in relation to practically every type of aeroplane in existence, and it can be shown that at no time has the official design been equal to the best contemporary design by a trade firm.

ANCIENT HISTORY AND A WARNING TO EXPERTS.

This is, of course, all ancient history, but history has such an unfortunate habit of repeating itself that one does well to guard against such repetition as carefully as may be. By way of emphasizing the fact, take the following abstract from "Torpedoes and Torpedo Vessels," by Lieut. G. E. Armstrong. On page 240 we find this:—

At the "Hornet's" official trial on March 19th, 1894, the mean speed for three hours with 30 tons load on board was 27.628 knots, the highest speed attained at that date. The horse-power was 4,000, with steam at a pressure of 169 lbs. This very high speed was not kept up for long after turning the vessel over to the Dockyard authorities, owing chiefly to the fact that for

some reason or other the Admiralty engineers insisted on altering the design and arrangement of the pistons. (The italics are mine.) This mistaken interference with the maker's original designs led to numerous mishaps, the piston-rods at last actually breaking. As a result the Admiralty very wisely decided to abide by the former judgment of the designers instead of the advice of their engineer officers. . . . Orders were therefore given to the contractors to replace the broken Admiralty pattern piston rods with those of their own original design, and since then no breakdowns of a like nature have occurred on board the vessel.

This should be a useful warning to official experts, and to those who control them, against tampering with the designs of people whose past performances prove that they know their business.

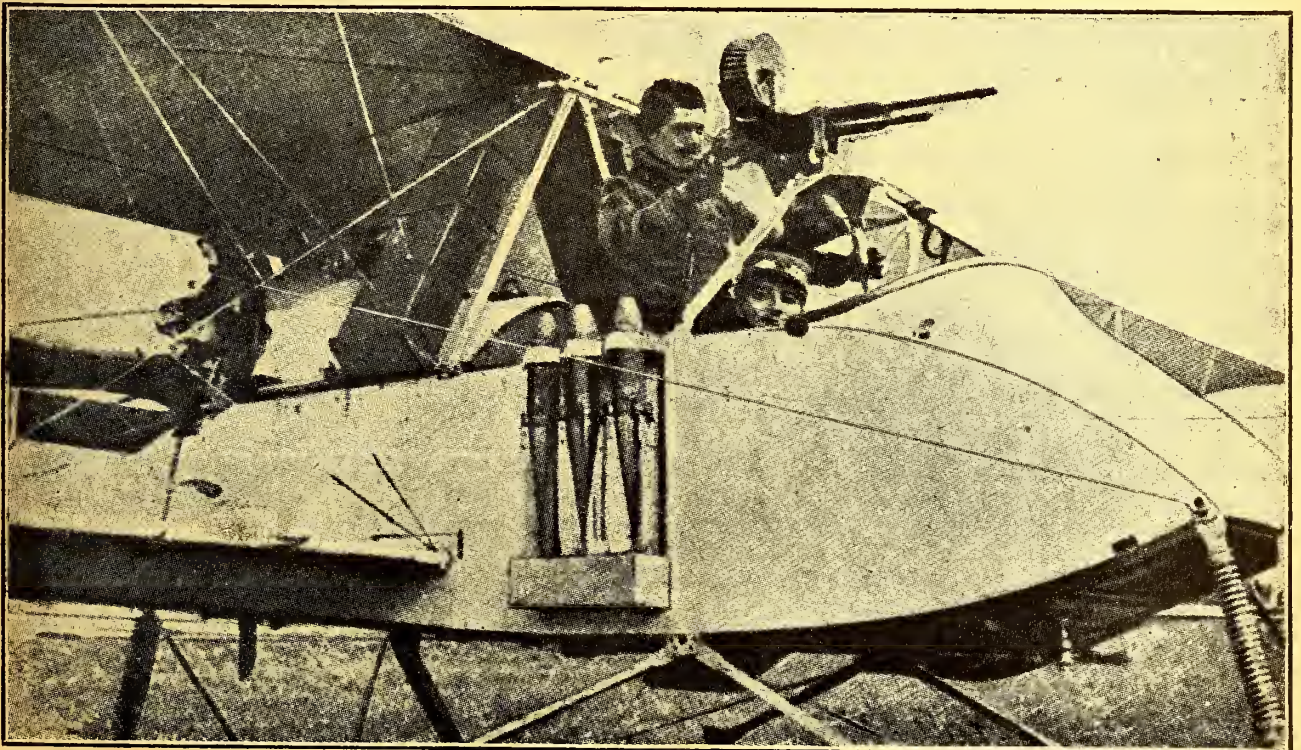
CAUSES OF BACKWARDNESS.

One has heard of officials insisting on alterations in aero-engines, with not dissimilar results, and any alteration means at best delay in production. Even after two and a half years of war we find ourselves very largely dependent for our best results in the air on French and even Spanish engines, and on French aeroplanes, albeit built in England.

Will anyone claim that, given a perfectly free hand and adequate support, even at the outbreak of war, and leaving out of question the anti-Trade pre-war policy of the War Office, we could not have produced in this country engines and aeroplanes as good as anything on the Continent? The key to the situation is that whereas the French manufacturer has always had a free hand to experiment as he wished, and the Spanish designer has been able to work on the "take it or leave it" principle, the British designer has been continually hedged round with official requirements, official specifications, official prohibitions, and so forth, so that his new ideas have been hung up till they were out of date. As Mr. Pemberton-Billing very truly said last week in the House, we have never been less than three months ahead of the Germans in design, where our best machines are concerned, *bien entendre*; and if we have always been behind in production, it has been because of official requirements.

OFFICIAL FAILURES.

It is not as if this hedge of official requirements were



A Voisin biplane of old type in the service of the French, equipped with machine-gun and small bombs. An interesting example of how things used to be done before bomb-dropping became a science.

any real safeguard. If a French maker's machines break in the air too often, his contracts are cancelled and he gets no more orders. Also, he stands to lose all payments for the stock in hand, so he is mighty careful that his machines do not break. If the performance of his experimental machine is not up to requirements, he gets no orders at all, which saves the nation's money.

Under our system, officially designed aeroplanes are ordered in quantities, on a paper performance, sometimes before the first machine of the type has ever flown at all. Huge quantities of parts and fittings are prepared, at vast expenditure of man-power and material. And if the machine proves a failure, those contracts have to be fulfilled, at the expense of still more man-power and material.

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And all these official calculations and tests and inspections and delays are apparently no real safeguard, for seemingly the officially approved or designed machines are just as likely to break in the air as any which are built on the common-sense French system. In fact, active-service pilots seem to have far greater faith in the proved French machine than in the calculated official output.

PERCENTAGE PER HUNDRED.

Where official figures are concerned, one is more than ever impressed with the sound philosophy of Mr. Pemberton-Billing's very subtle jest in the House last week, when he inquired whether certain figures were a "percentage per hundred." It is to be feared that the ordinary English mind, which is prone to take things literally, fails to appreciate the method by which figure-jugglers arrive at their results.

In a language where a "great gross" really means a gross of grosses, or something of that nature, and where a "hundredweight" is a hundred and twelve pounds, there is no guarantee that an official percentage bears any relation to a hundred units of the things which one happens to be discussing, for it may just as well be calculated on a hundred thousand and ultimately issued as units instead of thousands. Decimal points have a nasty habit of slipping about, and one appreciates the mental attitude of the late Randolph Churchill, who, when inspecting certain percentages presented by the officials of his department, inquired, "What do all these damned little dots mean?"

Consequently, when figures are presented to the Air Board showing that certain official designs are so much per cent. better in speed, so much per cent. superior in climb, afford so much per cent. better visibility, have so much per cent. factor of safety, and so forth, the Board may well inquire, "Does that mean percentage per hundred?" Otherwise "Does that mean percentage on paper, or percentage on a hundred machines actually produced?"

Incidentally, and apropos nothing at all, if a man buys something for £10 and sells it for £20, is his profit 50% or 100%? Obviously he makes 100% on his original outlay, and equally obviously his profit is only 50% of the sum realised out of the sale. Perhaps there may be a hint here for calculators of war profits.

AERO-ENGINE EXPERIMENTS.

The apparent exception of aero-engines from the order is rather puzzling, and an official explanation might well be issued. Is the phrase "other than any kind of aero-engine" inserted because experiments with aero-engines come under the control of another department, and so are prohibited separately, or does it mean that anyone can experiment with aero-engines to an unlimited extent, or is it merely put in to give an impression that experiments are encouraged, while all the while it is known that it is impossible to get material, tools, or

labour for such experiments? It would be just as well to be clear on the point.

I happen to know of at least one promising engine which has given excellent results on test, and in theory has notable advantages over most engines, yet that engine seems to be up against a dead wall, because further development is held up.

Incidentally, experiments with engines are far more costly than experiments with aeroplanes; so, if aeroplane experiments are prohibited, why not engines also?

A minor point which might also be made clear is whether the prohibition of the preparation of working drawings includes such drawings produced by draughtsmen in their own homes after having done the day's work for which they are paid by their employers. Most drawing-offices close at 6 p.m., unless there is a rush of work on, and a good deal can be done between then and midnight.

PROSPECTS OF SUCCESS.

The presumably official explanation of the order appears to set considerable store by the saving of labour and material to be effected by preventing the production of designs and machines "which have no prospect of success."

The saving of labour and material by preventing the production of designs can but be infinitesimal, for none of the established aeroplane firms are likely to produce designs "which have no prospects of success," and firms who would be likely to produce such designs are not likely to employ sufficient draughtsmen to make any calculable difference to the supply of drawing material or labour.

So far as producing complete machines is concerned, an experimental machine cannot well be built in less than a month. And if every firm with ambitions to build new types built twelve experimental machines per year, and if every one of those machines turned out to be what is vulgarly called a "dud," it is doubtful whether the total cost would amount to as much as the cost of the mistakes made by either of the official design departments in one month during the first two years of the war.

One trusts, therefore, that this pious resolution on the part of the Controller of Aeronautical Supplies that the mere Trade shall be prevented from "useless expenditure of labour and material" will extend equally to official experiments. The chief puzzle appears to be the question of who is competent to judge whether a design has "no prospect of success."

Let it be remembered once more that, whenever the R.A.F., or "D. Section," has let the Services down, the trade has always come forward with something that has saved the situation. True, the R.A.F., as it now is, does not appear to judge the designs of others. But one gathers that quite a fair proportion of the old R.A.F. staff is now in uniform as official "experts" on the R.F.C. side of the Air Board.

Also, it was stated in the House the other day that Lieut.-Col. O'Gorman, C.B., is technical adviser to the Director-General of Military Aeronautics. As technical adviser, at a salary which one gathers is a matter of £3,000 per annum, it seems reasonable to assume that he would be chief judge of whether a submitted design had a "prospect of success" from a military point of view or not. It also seems reasonable to assume that when this gentleman was Superintendent R.A.F. he was chief judge of the designs submitted by the staff of the R.A.F. Personally I have the greatest admiration for Colonel O'Gorman's outstanding ability in many directions; but if one gauges his judgment of aeroplane design by the products of the Royal Aircraft Factory when it was under his superintendence, one may reasonably

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hesitate before pledging oneself to the doctrine of official infallibility.

If it be the fact that Colonel O'Gorman is not the judge on this point, but that judgment is left to a committee of "experts," and if those experts be composed wholly or in part of the late staff of the R.A.F., then one has still less faith in their ability to judge whether a design has "no prospect of success," for if the designs for the R.A.F. aeroplanes and the R.A.F. engines of various kinds represented in their time their ideas of prospects of success, one could prophesy with safety an immense useless expenditure of labour and material, owing to their incurable optimism, were it not that one's faith in the good sense of the Aircraft Industry indicates that for its own sake the Trade would waste very little on experiments.

QUIS CUSTODIET.

As a matter of fact, there is still far more danger of

useless expenditure on official experiments, and through mistakes due to official alterations in perfectly good aeroplanes, than there is of the Aircraft Industry wasting man-power or material, if left to its own judgment. One trusts, therefore, that the members of the Air Board will keep a very close watch on his official experimenters and experts, lest this order be used for the prevention of Trade experiments and for the self-exaltation of officials who have already been found wanting on many occasions.

In itself the order is good, but, like many another true word, it may be "twisted by knaves to make a trap for fools." Happily, certain very important alterations for the better have already been made on the technical side of both Services, and there is less danger now than there has been in the past. Nevertheless, it is as well to recognise possible evils and to guard against them.—C. G. G.

THE MURDER CHARGES.

People seem so shocked by the use of the word "murder" in connection with the deaths of Service aviators that it may be of interest, purely historically of course, to place definitely when the expression was first used in the House of Commons in connection with Military Aviation. The following extracts from "Hansard," dated June 17th, 1913, may assist:—

"CAPTAIN FABER (Hampshire, U.) asked the Secretary of State for War if he would state whether the responsibility for allowing the aeroplanes that lately led to the deaths of Lieuts. Harrison and Arthur being allowed to fly in their deteriorated condition rested upon the officer commanding the Flying Wing."

Replying to a question from Earl Winterton (Sussex, Horsham),

"COLONEL SEELY said most careful reports were furnished when an accident took place, and he deprecated any suggestion that the officers did not do their work

well. From all the information he had, it appeared they were doing their work admirably, and the aeroplanes were in excellent condition."

"CAPTAIN FABER asked, did not officers of the Flying Corps hold a very different view, and did not some of them hold the opinion that the two officers mentioned were murdered by carelessness?"

Curiously enough, no Air Enquiry Committee was appointed for the purpose of discrediting Captain Faber. But, then, one must remember that in those days the evil Party System was in full existence, there was no Coalition, and Mr. Asquith and Mr. Bonar Law were opposed to one another. Mr. Bonar Law was in opposition, and Captain Faber is a staunch Unionist.

That is now getting on for four years ago, and merely proves that the more things change the more they remain the same, but so far as the recent charges are concerned, Captain Faber has what the patents people call a clear "claim of prior user."

TRAINING.—X.

BY "BERKELEY."

The advance of the German Army after contact had been joined with the British Expeditionary Force at the Battle of Mons was of necessity carried out at high speed in order to maintain touch between the opposing armies. Thus, when in time the retreating army came to an enforced halt, the outward sweep of the German legions would break the British forces conclusively in one decisive blow, and the completion of the long-laid plans would become certain. On the other hand, the closely pressed retreat might bring about the entire disintegration of the retiring columns without an encounter battle. In either case it was essential that the British should be given no rest.

But the historic result could not have been expected. Swift and determined though the German advance had been, the British troops did not entirely lose cohesion, and in consequence of earnest efforts and high ability of the General Staff, coupled with the enduring courage and optimism of the troops, a measure of co-ordination was attained at a moment when all seemed lost. The enemy, exhilarated by the splendid sweep of apparent victory, gave little apparent thought to a possibility of recovery. The German lines of communication had become dangerously attenuated. The necessary munitions and supplies could not reach the front line in sufficient quantities and with sufficient speed, should the opposition become unexpectedly determined. The German armies engaged had in the advance lost that closeness

of touch which alone ensures rapidity and decision of action. In truth, the pursuing columns, the right flank of the German Army, were for a time "in the air," unsupported. At this opportune moment the British relinquished the strategy of retreat and invited combat. Simultaneously French reserve troops began a move which threatened enemy flanks in a manner similar to the concurrent German plan of action.

There was little apparent desire to delay the enemy advance. There was no time to prepare many of the deadly booby traps of war. Little attempt could be made to prepare the roads that they might lead the enemy into less pleasant pastures than the plains of France. All had to be abandoned to the one chance of the enemy overreaching himself in his high endeavour.

The result is known to the world. The German onslaught was stayed. In their turn the necessity for consolidation made a retreat essential. In a few weeks the late battle front in France was installed, and parallel warfare of weary persistence and unchanging character held the Western front closely bound until two years later retreat again became the only solution of the problem.

Whatever the intention of the retreat from Mons, its conduct brought security to the Allies in the place of complete and disastrous defeat. The Germanic nations were in those early weeks within touch of the greatest victory in the history of the world. It is well at the

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same time to remember that the phase of warlike endeavour comprised in retirement prevented the fruition of the German plans.

So it is not too much to expect that the few instances quoted illustrate in some degree the importance of retreat as a deliberate operation of war, no less than a forced move at the call of superior force. It is dangerous in its psychology, and it is dangerous in execution, but nothing which lacks peril is of decisive value in war.

THE OCCUPATION OF ENEMY TERRITORY.

In all wars waged in accordance with the dictates of military science, one or other of the armies engaged will enter into the occupation of enemy territory. Few are the cases immune from the possibility of hostile occupation. Two island nations proclaiming a state of war and lacking means of oversea transport, or Switzerland at war with Brazil, would be in this position of ecstatic blessedness. But humanity is rarely gratified by such a vision of international inanition in war. Almost invariably one or other of the belligerents is in occupation of enemy territory, with all the responsibility and duties of such occupation.

A HAGUE CONVENTIONALISM.

Article 42, Section III, *Règlement concernant les Lois et Coutumes de la Guerre sur Terre* (Annex to the Hague Convention), reads: "Territory is considered occupied when actually placed under the authority of the hostile army. The occupation extends only to the territory where such authority has been established and is in a position to assert itself." As occupation in the technical sense of the word implies a state in which the conqueror and the conquered have certain duties and rights in relation to each other, it is necessary that clarity of definition shall be the preliminary foundation.

The population in occupied territory cannot in all cases leave for less disturbed parts of the earth's surface. They cannot, in the present state of public opinion, be exterminated as unnecessary. Their means of existence must not therefore be interrupted beyond the necessary disturbance due to the presence of war. They must be protected and controlled as in times of peace. Murder and robbery are none the less reprehensible when the enemy hold the land, even though the nations have momentarily systematised these offences on an international scale that one or other belligerent Power may in the end impose his will on the opponents.

The citizens of occupied territory still retain their allegiance to the dispossessed Government, and cannot be forced to transfer their devotions to the victorious enemy. The conqueror in temporary possession can only exercise his powers in the due maintenance of order and in continuance of the proper administration of the country. He cannot treat the country thus occupied as an integral part of his own domains, and he cannot "consider the inhabitants as his lawful subjects."

NECESSARY RUTHLESSNESS.

The exigencies of war may make it necessary for the occupier to destroy the property of inhabitants as a measure of precaution in protection of his own troops. No tower, whatever may be its æsthetic value or its historic interest, can be permitted to remain an adornment to the landscape if military reasons demand its removal. The ruthlessness of war demands many sacrifices, and international law can give no protection in the face of military necessity.

The occupation is generally made known by proclamation, and demonstrated by the presence of garrisons at vulnerable points throughout the territory in possession. A system of passes will indicate the reality of the change if no other mark is visible.

The laws and constitution of the country remain the

same as in days of peace. The common practice of Prussia in the transfer of land cannot vary the land laws of Belgium, unless the usages of war are wantonly violated by the most military of all nations. The victor cannot, if he adheres to universal practice, abolish the local government of cities, towns, and villages, unless that local government is actively subversive of order in the occupied area and a danger to the troops engaged.

LOCAL GOVERNMENT.

An endeavour is usually made to employ the lower civil servants left, and to continue them in their allotted routine duties, that little disturbance of civil rights may occur. While the laws of war sapiently affirm that these officials cannot be forced to continue work, they cannot be held disloyal to their true Government if they carry on their duties as in more peaceful days.

The senior members of the main Government will probably, in view of their complicity in the origins of the war, have retired with their defeated troops to safer and freer regions, and it is therefore essential that a form of government shall be imposed by the invader. The following note, "The Laws and Usages of War," relating to the German occupation of parts of France in 1870-1, is of interest:—

"In 1870-1, in France, the Germans, as they advanced, formed four occupied districts for administrative purposes, with headquarters at Strasburg, Metz, Rheims, and Versailles. A governor-general (who had under his orders all troops within the district not belonging to a particular army) was placed in charge of each district, and was assisted by a civil commissioner, whose duties were the direction of general administration of the district, the collection of taxes, and, conjointly with the intendants of the various army corps, the arrangement of requisitions and contributions. The commissioner was invested with the powers conferred by French legislation on ministers (excluding railways, telegraphs and posts); and he nominated *préfets* for departments, *sous-préfets* for *arrondissements*, etc. As the majority of French officials had fled, a number of German ones had to be summoned to France, but it was found impossible to provide for every post, and the functions of several offices were often carried out by one bureau. Thus, in place of the administration dealing with direct taxes, registration, stamps, and land, a single bureau of the director of taxation, with the functions of treasurer-general was nominated; the commissioners of police were also appointed controllers of taxation."

A RUSSO-JAPANESE PRECEDENT.

Similarly, during the Russo-Japanese War, the Japanese continued the local officials in occupied lands in the duties common to their office, and appointed commissioners to smooth away difficulties between the civilians of the occupied territory and the invading military. But all this goes to show that in past practice no less than in pure theory the conqueror does not habitually interfere with the domestic laws of the temporarily conquered peoples.

The occupant collects the taxes as laid down by the rightful Government of the country, and is held responsible for the expenditure of the money so gained to the degree for which the previous rulers were responsible. The balance after the settlement of proper expenses in civil and public matters can then be rightfully diverted to the use of the army of occupation. He cannot impose fresh taxes, for that is the duty and privilege of the dispossessed Government, and can only levy those previously imposed by statute or custom.

The religions of the country must continue without interference, unless in truth an active political propaganda is carried on under the guise of piety. Similarly the courts of law remain as in times of peace, unless the

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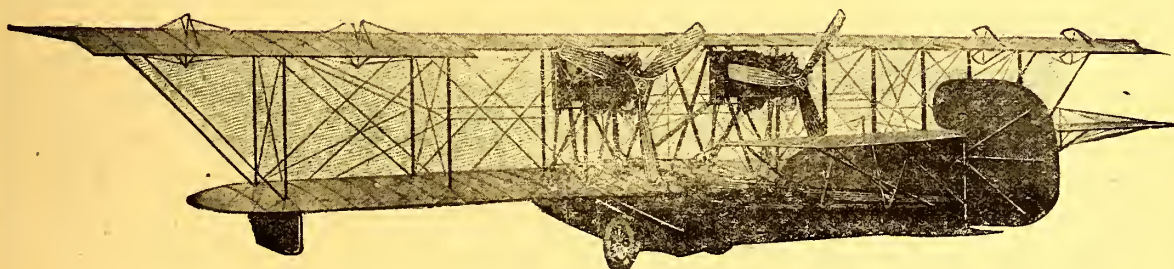
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personnel attached thereto have departed into greater safety. But whoever may administer the law, its theory and practice remain as before. War is not necessarily a time of joy to the expert and able criminal.

As with religion and with law so with education and charity. Schools and hospitals remain open, and continue their proper work with as little change as may be from the altered external conditions. These times are the truant boy's paradise.

The inhabitants may be compelled to perform such

labour as will maintain the public works of the country at their pre-war standard. Bridges and roads must not lose their one-time excellence if people remain to keep them in proper condition. Doctors, plumbers, lawyers, and other devastators of human kind in days of peace must of necessity continue their ordinary avocations, even among the enemy soldiery, if necessity demands. Their ordinary duties are affairs of humanity and not of faction.

(To be concluded.)

AIRCRAFT IN THE HOUSE.

In the debate on the Consolidated Fund Bill (Third Reading) on March 27th.

Mr. Billing: I should like to reply to one or two of the remarks in the lecture we have had from the Front Bench on the question of economy. I presume that this House and, what is more important, the people of this country, are supposed to condone every form of inefficiency and extravagance on the part of the Government on the understanding that it will be all right, and that we shall pay for it by high taxation after the war.

We have had some experience of the Board of Inventions. I know quite a number of excellent inventions which have been submitted to the Board of Inventions, and the Board found themselves utterly unable to cope with them. There is no definite and complete system for dealing with an invention on its merits, and I am afraid that if the suggestion of appointing a committee were carried out, we should find that committee over-burdened with complaints, and that they would find themselves snowed under with various applications.

I would still like to suggest that it might be possible for some form of economy to be produced, if there were committees of this House appointed to exercise a controlling hand on the extravagance and inefficiency in the respective departments.

There is hardly a Member of this House who does not know of cases of gross, grave and wilful waste which is going on at the present minute. Yet to whom can we go? We put down questions in this House and get evasive replies. A Minister cannot stand up at the Bench and give his Government away. We put down a question about a contract, and the first thing a Minister does when he goes back to the War Office or the Admiralty is to call for all the papers in connection with the contract. Then, on the information which is supplied, he sees that he stands condemned, because most probably the document is one which he signed himself without reading it.

We know quite well what Ministers do with documents. They are brought in in big bundles to be signed. I have brought them in myself. The Minister asks "Is this all right?" and he initials them or signs them without reading them, and that is going to cost the Government or the country half a million of money. And then when a Member of the House of Commons puts down a question the Minister sends for the document, reads it for the first time, and finds that he has sanctioned a contract which is wholly irregular, and to save his face he has to prepare an evasive answer. That is not only condoning extravagance; it is asking for waste.

R.E.7s.

I dare say that if I put down a question to-night for the Under-Secretary of State for War, and asked him what was being done as to the R.E.7 contract, he would immediately send for all the papers in connection with the contract, and possibly find that it was an order which was given for, I think, 1,000 of that type—or 500 shall we say?—which it was proved is a useless and wholly impossible type for an offensive against the enemy. The order was cancelled, but, as far as I can make out, owing to some mistake they forgot to cancel the order for the radiators—I think it was 1,000 radiators. We know that radiators are very expensive things.

Quite apart from the expense to the country there are thousands of highly skilled mechanics employed in making them. I understand that they gave large orders for spares for these machines, and they employ streamline tubing, which is almost unobtainable in this country to-day. We want it to meet the enemy in the air. Probably they will find when they get the papers that they forgot to cancel the orders, or if they did cancel them it was after taking delivery of a good many, and they are scrapped all over the country. They are still making the radiators and still delivering them, and I do not think it an exaggeration to say that the mechanics are earning 2s. an hour, which is double pay, for overtime for working at the radiators which will never be used, but will be scrapped.

SAVING WASTE.

If we had a committee in this House, we could go through and give this information, but the position is that if we give this information, it has to be so discreetly done.

Directly I come to concrete facts, I know that if I give them as

clearly as I could in this House, the Under Secretary for War would at once send for the contract officer to explain, and that officer would know that it was one of a few men who had given them away. The result would be that the officer in the Service, who was really working for his country, and to save its money, might be relieved of his command or commission.

I put a question the other day to my hon. friend as to what would happen to an officer who gave information to a Member of Parliament—would he be relieved of his command or his commission? I think the hon. gentleman was quite right and entitled to answer that he would be, and that under the circumstances he would be immediately conscripted as a private in the Army. That may be perfectly right, it may be impossible to conduct a war if officers are to give Members of Parliament this information; still, we may have the case of an officer who may say to himself, "I have tolerated this sort of thing for so long, that I feel I have to stop it." Suppose it is the case of an officer of some stores department, who sees waste to the amount of hundreds of thousands going on. He reports it to his senior, and whom does it reach at the finish? The man who is responsible for the waste, and he puts the document into a docket and turns it down.

It is absolutely necessary that, so far as the Air Service is concerned, a very careful inquiry should be made into the present waste. There are highly skilled men paid high wages at present on useless work, and we need now, more than at any time, efficient machines, and it is important that we should not lose the benefit of the labour at the present time. It is bad enough to lose the money squandered on these contracts, but it is even worse to lose their skilled labour in the manufacture of a class of machine which is so urgently needed. I think there is very great need of better administration than we have at present, so far as the technical side is concerned.

I have had brought to my notice, only to-day, a new order for machines to which I call the attention of the Under-Secretary for War. I would like him to tell me how many of these machines have been taken within the last week; I would like him to tell me how many men have been smashed within the last three days.

Is it the fact that B.E.2 C machines, with R.A.F. engines of 90 h.p. have been ordered for delivery within the next three or four months? These machines have a speed of something like 80 miles an hour, and a climbing speed of something like 550 ft. a minute, while there are machines which have a speed of 120 or 130 miles an hour, and a climbing speed of 1,000 ft. a minute.

THE QUESTION OF TRAINING.

And can the hon. gentleman tell me why the mortality among airmen is so high? Hardly a day goes by but two or three pilots are killed in this country. If my hon. friend, the Under-Secretary would like to know why, I will tell him. It is because to a great extent we are using the B.E. type machine for training. It is a stable machine and men can be quickly trained by it, but directly the man gets off the stable machine and gets on to an ordinary flier and starts cross-country work, if his engine stops and he makes a forced landing he finds the landing speed so much higher than that of the machine on which he was trained, that when he attempts to land in the middle of a field he is generally found in a hedge or tree, because he never had any training on those sensitively controlled machines.

The man always swears by the machine on which he was trained until it lets him down. Until he gets to the front the B.E. type will not let him down. It is an ideal machine for peace conditions, provided you do not take too many liberties. My contention is that it is no good training a man on a peace-time machine hurriedly, and then send him to France to use a war-type machine.

There is no difficulty in teaching a man to fly on an easy type of machine, and it is because they are teaching men on the easy type at first that we are having so many accidents in this country directly we send the men to cross-country work on the various other machines.

That constitutes not only a very considerable loss of man-power, because pilots are scarce and valuable, but, as well, the pilot

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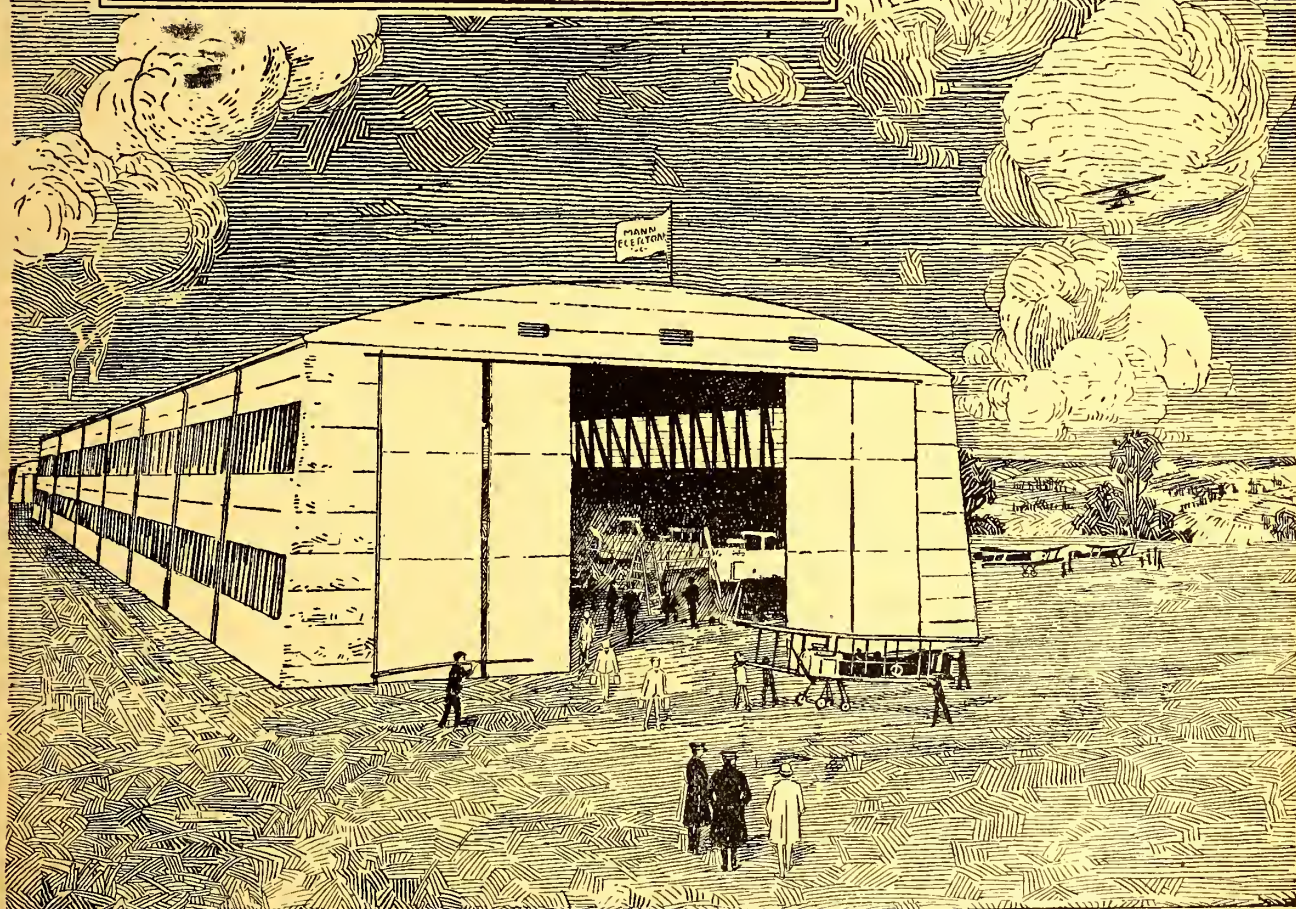
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represents to this country a certain cash value which we shall have to pay in taxation after the war. I expect if you took the whole cost of the training in the last two years and spread it over the number of pilots we have trained, you would find that the pilot has cost not less than from £2,000 to £3,000 per head to be trained.

We have all the officers and the engineering establishments necessary to keep up in order to train these men, and the machines they smash must also be debited to the cost of training. We are short of pilots and machines to-day, and yet I do not think I should be exaggerating if I said that we have in this country to-day thousands of aeroplanes. When I put down a question in this House I have got accustomed to the stereotyped answer that "It is not in the interests of the country," or "We shall be helping the Germans if we say that this type of machine has been stopped."

A wave of panic would go through the German Flying Corps if my hon. friend would rise up and say that the B.E. type of machine had been stopped in France, because the Germans would then know they would be coming up against something that was a bigger fighting proposition than that particular type of machine.

OUR UNDISPUTED LEAD.

It is absolutely essential that the whole question of our Air Services should be reviewed to-day. It is an extraordinary thing, it is a regrettable thing, but it is an absolute fact which anyone who has inside information can satisfy himself upon, that never since the outbreak of the war have we been less than three months ahead of anything the Germans have produced—we have been three months ahead of them on design and performance, and we have been 12 months behind them on production right through the war, and I say that the men who are responsible for this administrative muddle ought to be brought to book.

I make no personal attack. It is a very difficult thing for me, as lately in the Service myself, to stand up here and make anything in the nature of a personal attack, but if there are certain officers in senior commands or in supreme command of a certain Service, it is impossible to dissociate one's criticism from those men. Either they are ignorant of what is going on which proves conclusively that they have no right to occupy that position, or they are aware of what is going on, in which case there is no excuse for them at all.

There have been more men killed by "Koh-i-noors," by pencils, by calculations that have taken place in our drawing offices, than there have been by gunfire by the enemy in the air. The most elaborate calculations are constantly going on, as I have said time and time again, and at the present minute there are technical advisers, who through their technical advice have cost this country millions of money, and they sit there to-day. Hyde Park itself could not hold their blunders if they were spread out. They have been there from the beginning of the war, and, so far as I can see, unless the criticism in this House is sufficiently strong, there they will remain, to the cost of this country.

Only the other day it was suddenly decided to build a new type of machine. They got hold of a certain type of engine and they called on a certain designer, who is a very well-known man, to get out a design, so that they could farm its building out to — firms. Orders were given for ten of these machines each to — firms; and when they went to get the drawings, the — said, "You had better go down to —'s and get the drawings." The representatives of these — firms went to —'s to get the drawings to build this wonderful type of new machine, but when they got there they found there were no drawings. Several weeks went by and eventually they got about five or six sheets of drawings, and for that particular machine there are 978 separate sheets of drawings. This went on for a fortnight, and then the firms in question went and said, "We cannot get on. We have all our men

hung up, and only about eight sheets of drawings for several parts of this machine, and there is no work for the men to do." So to keep these firms quiet a certain officer in the —, whose name I shall be pleased to give the hon. gentleman, said they had better have an order for ten more, and these were ordered. Still they got no more drawings, and to keep them quiet another order for ten machines was given. They went again about the drawings, and a further order was given for ten machines. When the order had increased altogether to 250 machines they started to worry for the general drawings. The engines were delivered, and they were waiting to get on. I think I am right in saying not one machine of that type has ever been erected. After about three months of this, these firms were all called to the — and told that it had been decided that that type of machine was a wash-out, and all the work they had done was cancelled. They said: "What are we going to do?" and the officer in question said: "You had better build —s." What is known as that was a wash-out two years ago. It is an obsolete type of machine.

Those firms, I think, at the moment are building those obsolete or obsolescent type of machine, simply and solely on account of the mess-up which these young officers made over this order, to keep them quiet. That thing ought to be inquired into by a committee. When an officer knows a thing like that is going on, when a contractor knows he is becoming a party to robbing the country like that, we must have something in the nature of inquiry. That is why I suggest that a committee of Members might be very well employed in inquiring into cases of this description, which would render it quite unnecessary for me to raise them on the floor of this House.

Mr. H. P. Harris: Will you go before that committee.

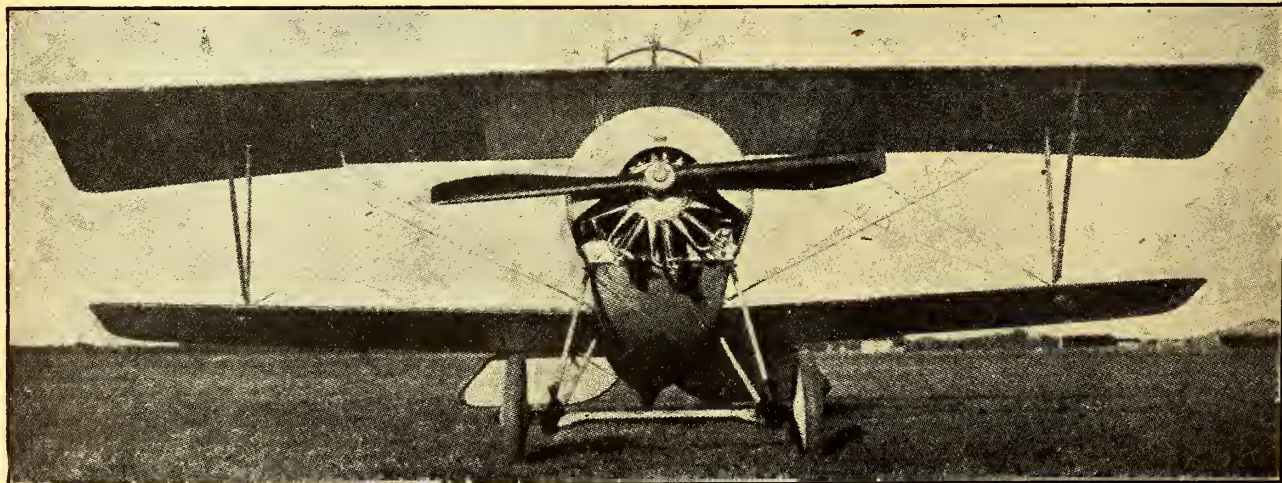
THE NEED FOR INQUIRY.

Mr. Billing: I have been before all the committees up to now. I may add I have previously raised in this House the question of sending men out on machines that everyone knows to be inefficient. If we sent men to-day to sea in coffin ships there would be only one name for the men responsible for so doing. Yet the figures my hon. friend gave when, in my absence last night, he replied to me, regarding the losses at the front, are decimals. I find it impossible to discover how he can kill decimals of men. I think the figure given for six weeks was an average of 7.6.

The Germans are quite aware of our losses; they register them. I should like my hon. friend to give a frank statement to the House as to what our actual losses really are, not only in France, but on all our fronts and in England. I assure him that it would take a great deal more than those figures to frighten the men flying for us to-day. We owe them a very considerable debt. No matter how we propose to pay it after the war, we cannot do better during the war than to provide them with the best material it is possible to obtain, and the best administration that it is possible to give. I have been accused of using violent language here. I shall go on using violent language. If that is the only possible way of attracting attention to the present Administration I shall do so.

Mr. MacVeagh: It is the only way to move the War Office, anyway.

Mr. Billing: As I have said before, I did not come here to achieve a reputation as a politician, a debater, or anything else of that sort, but for one distinct purpose. I regret that the only thing I have succeeded in doing in twelve months has been to persuade the Royal Flying Corps that it was possible to train pilots to fly at night, and thereby settle the question of the Zeppelin menace. This, by the way, was possibly the best friend the Air Service ever had, because it awoke the people in this country to see what air control might really be. In the next summer we shall experience raids of a much more serious character than Zeppelin raids.



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AEROPLANE RAIDS AND REPRISALS.

There is another question, that of raids by heavier-than-air machines—aeroplanes. I assure the House that there is no defence against a raid by them. Aeroplanes may come over to this or any other country at night, and at 15,000 or 20,000 feet they may drop their bombs and get back long before we know where they are. It is quite a job finding a Zeppelin at night. It is an impossible thing to find enemy aeroplanes at night. There is only one way by which we shall be able to stop air raids of heavier-than-air machines: that is by reprisals. Whether this country likes reprisals or not bothers me very little.

I would like to see our Air Service to-day ready, fit, and able to carry out those reprisals; otherwise, we shall have such a wail of indignation if we are raided day and night in the coming months, that it may bring the Government down as it brought the French Government down.

It would be unfortunate if the Air Service brought this Government down as well, because it requires so little to put it right, for there never was a country with finer material. We have the finest designers and mechanics and by far the best pilots in the world and the best facilities. There is only one thing clogging the wheel and holding the wagon of success from going forward, and that is the incessant intrigue and bickering and jealousy, and the desire of certain men to exploit their own ideas and designs instead of having to work out their ideas in competition with other machines.

A SOUND APPEAL.

It does not matter whose idea the machine is so long as it can prove by a test to be the best of its type, and then it should be adopted. I ask the Government to consider this matter, and I also ask the Under Secretary for War not simply to wonder how he can evade replying to my points and endeavour to trip me up on points which I have made incompletely, but to be English in the matter. (An Hon. Member: "Scotch!") Yes, Irish, or anything you like, but be humane, and remember that even at this moment we are needlessly sacrificing the best lives of our country and squandering thousands of pounds which we shall have to pay in taxation.

The Under Secretary should remember that his position is one of great public trust, and the lives of men are dependent upon what he does. I would ask him if he can meet certain Members of this House to consider these questions? I am not the only hon. Member who receives letters. Many other hon. Members have information which will support what I have said to-night. Why not have a conference of these men and cut out all this political twaddle? Let us meet face to face and have it out, and see if we cannot get this matter put right instead of trying to hide and cloak up everything.

QUESTIONS ON THE R.F.C.

On March 28th Mr. Pemberton-Billing asked the Under Secretary of State for War whether the statistics as to the killed, wounded, and missing in the Royal Flying Corps recently given embraced the whole Flying Corps, or only that part of it operative on the Western front; and, if so, can he now state our losses for the last six months of killed, wounded, and missing of the whole of the Royal Flying Corps both at home and abroad?

Mr. Macpherson: With regard to the first part of the question, the figures I gave related to the Western front. In reply to the second part, I am sorry that, in the public interest, these figures cannot be given.

Mr. Watt: Does the hon. gentleman still maintain that we can hold our own in aeroplanes on the Western front?

Mr. Macpherson: I cannot add anything to the exhaustive statement I made the other day.

Mr. Joynson-Hicks: When the late Lord Kitchener was Secretary of State for War did he not think it was not against the public interest to publish these details, and why does the present Secretary of State for War think it is inconsistent with the public interest?

Mr. Macpherson: I have not consulted my noble friend the Secretary of State, and I am not aware that my late noble friend made any such statement.

ACCIDENTS DURING TRAINING.

Mr. Billing asked the Under Secretary of State for War what is the percentage of accidents, fatal and otherwise, that have occurred during the training of pilots for the Royal Flying Corps for the last six months of 1915 and 1916, respectively?

Mr. Macpherson: 1.5 per cent. in 1915 and 1.53 per cent. in 1916.

Mr. Billing: What is the percentage based on? Is it percentage on the whole number? Is it percentage per hundred?

Mr. Outhwaite asked the Under Secretary of State for War how many of the Royal Flying Corps have been accidentally killed in this country during the past three months; in how many cases the accident was due to defect in the aeroplanes; can he say in the latter cases what action has been taken to fix responsibility; and with what result?

Major Baird: The total number of casualties in the Royal Flying Corps in this country for the period December 1st to February 28th was 58. Of this number three were due to breakage of

machines. Every accident is reviewed by a Court of Inquiry, and in any case where it appears advisable that some structural modification should be made in any particular type of machine, action is taken accordingly.

Mr. Outhwaite: If not due to structural defect, is it due to ineffective training of the pilots?

Major Baird: I think it is impossible to say to what a flying accident is due. Flying is a very difficult thing to do, and is a new Service. It is quite impossible to say on each occasion of an accident what it is due to.

Mr. Outhwaite: Is the hon. and gallant gentleman satisfied with the position as it is to-day? Does he think there is no remedy for this large casualty list?

Major Baird: No one can say he is satisfied with anything connected with aviation. It is in its infancy, and improvement is being made in every respect as regards training as experience suggests.

Mr. W. Thorne: Is the hon. and gallant gentleman satisfied that the best material is being used and the best workmanship, and the best possible engines are being put into the machines?

Major Baird: I can safely say the system of inspection is as thorough as it can possibly be made. Like everything else connected with aviation, it is being perfected every day.

Mr. Billing: As I understand 30 per cent. of our total efficiency is being killed during training, will the hon. and gallant gentleman consider the advisability of altering the system of training, which is largely at fault for all these accidents?

Major Baird: If I rightly understood the hon. Member to say that 40 per cent. of our total efficiency is being lost in training, he is entirely in error. I have not the figures in my head, but I know they are nothing like that.

LORD COWDRAY (MEETING WITH MEMBERS OF PARLIAMENT)

On March 29th Mr. Billing (by Private Notice) asked the Prime Minister whether the Chairman of the Air Board has expressed his willingness to meet the Members of this House for the purpose of debating the present position of our Air Services; whether these proceedings will be private, and whether the Chairman is prepared to receive written questions prior to such a meeting, that he may be enabled to answer them at the meeting; and also when it is proposed that this meeting should take place, and where it will be held?

The Parliamentary Secretary to the Air Board (Major Baird): The Prime Minister has asked me to answer this question. The President of the Air Board has been asked by the hon. Member for Brentford to meet a body of Members of both Houses, known as the Parliamentary Air Committee, who desire to lay their views before him. Lord Cowdray has consented to do so. The date of the meeting is not fixed, but it will take place in the House of Commons after the Easter adjournment. The procedure will be quite informal.

Mr. Billing: Do we understand that that meeting is to be open to any Member of this House?

Major Baird: It depends upon whether he is a member of the Air Committee, I imagine.

Mr. Pringle: Will the Chairman of the Air Board follow the example of the Food Controller, and invite Members generally to come?

Major Baird: One reason why they have not all been invited is that he was not asked to do so; if he were asked to do it, I have no doubt my noble friend would find no difficulty whatever in meeting any Member who may desire to meet him.

Mr. Lynch: As a member of the Air Committee of this House, may I protest against such a meeting being restricted to members of the Committee?

Mr. Speaker: The hon. Member must ask a question, not make a statement.

Major Baird: My noble friend was asked by the Chairman of the Parliamentary Air Committee whether he would meet the members of the Committee, and he said "Yes," and it is difficult to see what reason there can be for objecting to that.

Mr. Billing: Will the hon. and gallant gentleman give an undertaking that every Member of this House shall receive an invitation?

Mr. Faber: Is not Lord Cowdray a public official, and if he comes to the House of Commons as a public official can any meeting be restricted to the members of the Air Committee, or must it not, of very necessity, be extended to all Members of the House?

Major Baird: I think other Members can come if they want.

Mr. Faber: Will my hon. and gallant friend put it much more clearly than that? If no doubt other people can come, will he not say plainly that this meeting is open to all Members of the House?

Major Baird: I thought I had said so. If they want to come they can come.

Mr. Joynson-Hicks: May I make a personal explanation? As Chairman of the Parliamentary Air Committee, with the sanction of the executive committee, I applied to Lord Cowdray to ask whether he would meet us to discuss certain points. I had no authority whatever to do so on behalf of the House generally, and

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it was purely a private meeting with a certain number of members who had banded themselves together. I should not have presumed to ask any Minister to meet the Members of the House generally.

ARMY OFFICERS (INFORMATION TO MEMBERS OF PARLIAMENT).

Mr. Billing asked the Under Secretary of State for War if he will state, with reference to officers giving information to Members of Parliament, which, although not necessarily in the interests of the administration, may be in the interests of the country, whether any officer discussing Service matters with a Member of Parliament is automatically dismissed from the Service?

Mr. Macpherson (in a written answer) said: If the matters and information mentioned by the hon. Member do not come within the purview of the Official Secrets Act, the Defence of the Realm Regulations, and paragraph 453 of the King's Regulations, it does not appear to me that any offence would have been committed. The hon. Member will find the conditions under which an officer may be dismissed from His Majesty's Service by reference to the Army Act and the provisions of paragraph 525 of the Royal Warrant. There is no such thing as automatic dismissal from the Service. I may also point out that any person, not lawfully authorised, is prohibited under No. 18 of the Defence of the Realm Regulations from eliciting naval or military information.

PILOTS (TRAINING).

Mr. Billing asked whether the system of training pilots at present employed in the Royal Flying Corps is the same as that employed in January, 1916?

Mr. Macpherson (in a written answer) said: Yes, Sir, but as facilities have increased and greater demands have been made from France the standard has been raised.

AEROPLANES (ORDERS).

Mr. Billing asked the Parliamentary Representative of the Air Board whether aeroplane builders who have received Government orders for the building of machines which are now considered obsolete or obsolescent for active service conditions have now had these orders cancelled; and, if not, why this has not been done?

Major Baird: I would refer the hon. Member to the last part of the answer which I gave to him on the 7th instant.

BUILDING POLICY.

Mr. Billing asked the Under Secretary of State for War whether the building policy of the Director-General of Military Aeronautics is being persisted in as to types and numbers; whether he is still responsible for deciding as to types and numbers; and, if not, for what reason has he been relieved of these duties?

Major Baird: The responsibility for the design and supply of aeroplanes for the use of the Royal Flying Corps (Military Wing) ceased to be vested in the Director-General of Military Aeronautics on the establishment of the present arrangements whereby a joint system of design and supply for both the naval and military branches of the Air Service has been established under the Air Board, of which Sir David Henderson is a member, and the Ministry of Munitions.

RAIDS ON ZEEBRUGGE.

On March 30th, 1917, **Mr. Pemberton-Billing** asked (1) how many raids have been carried out at Zeebrugge in the past twelve months; (2) whether for the past twelve months we have had sufficient pilots, machines, and high explosive bombs stationed at Dunkirk to initiate raids on the submarine bases at Zeebrugge every night; and, if so, why a continuous bombardment of this enemy submarine headquarters had not been permitted; and (3) on whose authority air raids at Zeebrugge and districts are initiated by the Royal Naval Air Service squadron situated in the Dunkirk district; and whether the local Wing Commanders have power to initiate raids from time to time on definite objectives, or whether for each raid it is necessary to obtain definite instructions from the Admiralty?

Dr. Macnamara: As regards these questions it is not considered desirable in the public interest to give the particulars asked for.

Mr. Billing: May I ask the right hon. gentleman whether the Germans are unaware of the raids that we have made upon them in the past twelve months, and, under these circumstances, is it not possible to give us in this House facts of which the Germans must be aware, if they have been raided?

Dr. Macnamara: It is more than likely that they are aware, but as regards these three questions, it is not considered in the public interests to give the particulars asked for.

Mr. Billing: Is the right hon. gentleman aware that the submarine menace at the present time is due to the weakness of the Royal Naval Air Service in not bombing Zeebrugge from the first?

Mr. Speaker: That does not arise out of the question on the Paper.

EXPERIMENTAL MACHINES.

Mr. Billing asked whether the officials of the Royal Naval Air Service are still ordering machines on their own responsibility without consultation with or, alternatively, in opposition to the views and wishes of the Air Board?

Dr. Macnamara: All orders for machines are placed by the Supply Department of the Air Board.

Mr. Billing: Is the right hon. gentleman aware that the Royal Naval Air Service are giving orders for experimental machines in — and elsewhere without consultation with the Air Board,

and is he aware that the Ministry of Munitions have just issued an Order stating that no firm is to be permitted to do this work, and what is the position of a firm which refuses an Admiralty official?

Mr. Speaker: The hon. Member must give notice of that question.

OFFICERS (DISTINGUISHING MARKS).

Mr. Billing asked the First Lord of the Admiralty whether he is aware that distinguishing marks are worn on the uniforms of squadron-commanders, flight-commanders, and flight-lieutenants in the Royal Flying Corps for the purpose of differentiating between these three ranks; and whether he will consider the desirability of adopting a similar system of differentiation in the Royal Naval Air Service?

Dr. Macnamara: This matter is under consideration.

Mr. Billing: Will the right hon. gentleman consider the advisability of having some distinguishing mark between a flight-lieutenant, a flight-commander, and a squadron-commander in the Royal Naval Service, as the present position is most difficult?

Mr. Watt: Will the right hon. gentleman say how long it has been under consideration?

Dr. Macnamara: If the hon. Member desires the information, I will consult the Air Board.

AEROPLANE CONSTRUCTION.

Mr. Billing asked the First Lord of the Admiralty whether he is aware that the wing fabric of a new aeroplane built in England to French design burst in the air recently; whether this accident was due to the French structural design having been altered by an official or officers of the Royal Naval Air Service; whether this accident indicates that such alteration would have been a source of danger to pilots on active service; and whether steps have been taken to prevent a repetition of such tampering by Admiralty officials with designs of proved excellence?

Dr. Macnamara: As regards the first part of the question, such an accident did occur. It was not due to faulty design. Neither is it true to say that it was due to alteration in design by an official or officers of the Royal Naval Air Service.

Mr. Billing: Is the right hon. gentleman not aware that the fabric which was put in place of three-ply wood caused this accident, and that it was done against the advice of the constructor, but the Admiralty insisted upon it?

Mr. Booth: Was it supplied by a German firm, and found to be faulty?

Dr. Macnamara: I cannot say that. The hon. Member must give me notice of the question.

Mr. Billing asked whether any officer or official at present concerned with the construction or origination of aeroplanes, or who has planned designs for the Royal Naval Air Service has ever produced a successful flying machine of the heavier-than-air type; whether any such machines have been used on active service; whether several officers who have produced successful designs before the war and joined the Royal Naval Air Service on or about the outbreak of the war have left the Service and entered the employment of private firms; and whether the residue have been proved to possess sufficient ability to justify their being entrusted with the approval, alteration, or condemnation of designs produced by private constructors of proved experience?

Dr. Macnamara: The answer to the first two parts of the question is in the affirmative. As regards the third part, officers have been allowed to resign their commissions in order to enter the employment of private firms where it has been clear that their experience and technical knowledge would be of advantage in the production of machines, and, therefore, in the public interest. As regards the last part of the question, the hon. gentleman is, of course, aware that the general question of the design of aircraft is now a matter which is dealt with by the Air Board. That being so, it does not appear to me that any useful purpose would be served by discussing by way of question and answer the abilities of the technical officers of the Royal Naval Air Department.

Mr. Billing: Can the right hon. gentleman give me the name of any type, or the name of any given machine, which these officers have designed which has been successful?

Dr. Macnamara: The hon. gentleman must put that question on the Paper.

AEROPLANE ORDERS.

Mr. Billing asked the Under-Secretary of State for War whether an aeroplane known as R.E.7 is still employed for offensive work; when was the first order placed for this type; how many were ordered; how many have been delivered; and whether it is proposed to take delivery of the balance, or whether the orders have been cancelled and the contractors compensated, so that they may apply their labour to more productive work?

Major Baird, in a written answer, said:—The answer to the first part of the question is in the negative; to the second, third and fourth parts that it is not in the interests of the country that details of this kind should be published; and to the last part of the question that deliveries of this machine ceased some time ago.

Mr. Billing asked when the Order for R.E.8s was placed; what number was ordered; how many have been delivered; whether any serious accidents have happened to the pilots flying these

(Continued on page 872.)

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BY CHARLES L. FREESTON.

(Founder Member of the Royal Aero Club.)

X.—THE GRAHAME-WHITE AVIATION CO., LTD.

The manner of Mr. Claude Grahame-White's entry into the field of aviation gave me one of the chief surprises of my life. I remember his hurtling into my office in November, 1909, with the announcement that he was going to have a shot at the "Daily Mail's" £10,000 prize for a London to Manchester flight! But at that time he had not even qualified for a pilot's certificate, and was still learning to fly when he resolved to attempt at an early date what was generally regarded as an impossible achievement.

In arriving at this decision Mr. Grahame-White displayed not only the quality of pluck, which every Briton believes himself to possess, but also a strong sense of the dramatic, which is a more Latin characteristic than British. Add to these an inexhaustible fund of energy, and we epitomise the predisposing causes of Mr. Grahame-White's many and by no means unremarkable successes.

THE FIRST MACHINE.

It was at the Reims meeting of August, 1909, that he ordered what should have been his first machine—namely, the 60-h.p. two-seater which M. Blériot had built for the first Gordon-Bennett air race. But this was the very craft on which M. Blériot had his memorable escape from death. It caught fire in mid-air owing to a petrol leakage on to a hot exhaust, and was burnt up after it fell.

Then Mr. Grahame-White spent three months in the Blériot factory, and assisted at the construction of a duplicate machine. By November it was ready, and he made his first trials with it at Issy-les-Moulineaux, succeeding in obtaining several short straight flights after only twenty minutes' practice with the controls.

AT PAU.

The machine was too fast, however, for the small aerodrome at Issy, and a move was made to Pau. By the first week in December Mr. Grahame-White had flown the "White Eagle," as he had named it, a distance of 24 kilometres at an average height of 250 ft., and on the 16th he made the flight for which the Aero Club de France awarded him his pilot's certificate.

On the strength of this the Royal Aero Club awarded him a British certificate on April 26th, 1910, but he regards as something of a grievance that he was not inscribed as number one on the Club list instead of number six.

THE FIRST SCHOOL.

Even still while learning at Pau Mr. Grahame-White conceived the intention of establishing a flying ground within easy reach of London. In the first instance, however, he set up a flying school at Pau, and among his early pupils were Miss Spencer Kavanagh, the first British woman aviator, and Mr. Armstrong Drexel, who subsequently put up a world's record for altitude.

During a visit to London in January, 1910, Mr. Grahame-White made several flights at Brooklands. He also provided Londoners with the novel spectacle of an aeroplane being drawn through the streets on its own wheels behind a motor-car, from Hendon to Walham Green, the wings being dismantled and attached to the sides of the frame. Before returning to Pau he inspected the present site of the London Aerodrome at Hendon.

The 60-h.p. Blériot, of course, was not the simplest of machines to land upon, and Mr. Grahame-White had several smashes, which cost him in all between eight and nine thousand pounds. He amused himself by pasting up the bills on the walls of his shed.

His worst fall occurred when he was gliding down with the engine cut out, and as the wind proved stronger than he had bargained for, the machine was stalled and a bad nose-dive was the result. He was cut about the face and severely shaken. Another time he side-slipped into the bed of a stream, and the machine was wrecked. More fortunate was a mishap when he was flying over the town of Pau; the engine stopped when he saw nothing below but streets, tramways and houses, but by good luck he managed to alight safely in a garden.

M. Blériot himself, on one occasion, with Mr. Grahame-

White as passenger, wrecked the machine in making the discovery that it had an insufficient amount of rudder surface. He could not bring it round enough to avoid a wood, so made a hasty descent into a hedge.

THE LONDON-MANCHESTER.

These incidents had not shaken Mr. Grahame-White's resolve to attempt the London-Manchester flight, for which he had, in fact, ordered a Henri Farman biplane, fitted with a 50-h.p. Gnome engine. In March, only a short time after his severest fall, he went over to Mourmelon to take delivery of this machine, and at the second attempt he flew it for 65 minutes.



Mr. Claude Grahame-White.

He then took up his mother as a passenger. Early in April he formally entered for the "Daily Mail" £10,000 contest, and on the 21st he made his first attempt to win it. The conditions, it may be remembered, required that the machine must not make more than two stops for petrol.

The start was made from Park Royal at 5.17 a.m., and the gasometers at Wormwood Scrubs were first circled in order to comply with the proviso that the machine must pass within five miles of Carmelite House. Heading then for Willesden Junction, Mr. Grahame-White flew across country for 83 miles, and landed at Rugby at 7.14 a.m. He re-started at 8.15 a.m., with 93 miles still lying between him and Manchester. Engine trouble and high winds, however, compelled a landing at Hademore Crossing, near Lichfield, the total distance from the start being then 117 miles. While he was waiting for the weather to clear, the machine, which had been imperfectly pegged down, was uprooted by a violent gust and badly damaged. So ended the first attempt upon the £10,000 prize.

THE SECOND ATTEMPT.

The machine was brought back for repairs to the airship shed at Wormwood Scrubs. Then Louis Paulhan arrived upon the scene, together with a Farman of which the lower plane had been shortened for speed purposes. Naturally the contest was now invested with redoubled interest, and great was the excitement of the public when it was learned that the rivals were only waiting for a favourable moment to start.

Paulhan, who had taken up his quarters at Hendon, rose into the air at 5.31 p.m. on April 27th, and made a non-stop flight to Lichfield. Mr. Grahame-White left Wormwood Scrubs at 6.29 p.m., and had therefore not only less daylight but also a slower machine than Paulhan, and as a matter of fact descended at Roade, having covered 60 miles.

With a degree of courage which it is difficult to measure, now that night flying has become an everyday occurrence, Mr. Grahame-White decided upon the bold endeavour to make up his leeway by starting in pitch darkness. At 2.45 a.m. he left the very tight corner in which he had landed at Roade, and, relying upon the headlights of motor-cars and the signal lamps of the railway, he flew as far as Polesworth, but descended there at 4.14 a.m. in consequence of the violent wind. Paulhan, however, rose at dawn and reached Manchester without trouble.

To the public the "great flight" was a much-needed education; even the very people who put up the mammoth prize had not expected that they would have to part with the cash so soon—an experience in which they were by no means alone, as witness M. Michelin's surprise when his Paris to the Puy de Dôme prize was so speedily annexed.

POPULAR ACCLAIM.

Louis Paulhan received a generous share of congratulations from the British public, but the loser became a veritable popular idol as the result of his sporting efforts. He was in great request for exhibition flights, and the first of these was at Ranelagh. In conformity with a resolve he had made months before in Paris, however, to enter London from an up-river point, he reached Ranelagh by way of Brooklands and the Thames. About this time he also conceived the idea of a flight from London to Paris, and built a special machine for the purpose. This intention was never realised, but on the other hand Mr. Grahame-White, as will be seen later, was the first man to fly from Paris to Putney on a seaplane.

EXHIBITION FLIGHTS.

After Ranelagh he was engaged to give demonstration flights for a period at the Crystal Palace. The site apportioned him for the take-off was appalling, and was even worse for landing. When

he left for a few days, in order to fly before the King at Torquay, the Crystal Palace authorities endeavoured to find a substitute, but various pilots who were approached severally refused the job as soon as they had inspected the site.

At the aviation meetings of that year Mr. Grahame-White was a prominent attraction. He won the aggregate prize of £1,000 at Wolverhampton and the duration prize at Bournemouth (over 90 miles), and flew round the Blackpool Tower. At Halifax he was accorded a civic reception, and there committed himself to the prophesy that in ten years we should have "taxiplanes"! As this was on June 9th, 1910, the prediction has still three years of life.

IN AMERICA.

The outstanding feature of this eventful year, however, was the American tour which Mr. Grahame-White began in August. The number of prizes he carried off was truly astounding, and has probably never been equalled in the way of a triumphant progress, but it must suffice to mention the premier event—namely, the Gordon-Bennett speed race, which he won on a 100-h.p. Blériot.

During his sojourn in America he also performed two particularly noteworthy feats. One was to fly round the Boston Light, covering a course of 33 miles in 34 minutes, nearly all over the sea. The second was an undertaking which he confesses he would not altogether care to repeat, even with a modern machine. He flew over the city of Washington and planed down into Executive Avenue, where he called on President Taft at the White House. After lunching with Admiral Dewey at the Metropolitan Club he returned to the place where he had left his machine, and rose from the middle of the street, returning to the flying ground at Benning. Judging by an inspection of a photograph of the machine in Executive Avenue, I can only compare the feat to an ascent, say, from the middle of Piccadilly.

THE LONDON AERODROME.

On his return to England he was presented with the gold medal of the Royal Aero Club. Before the year closed he acquired a tract of land at Hendon, which was destined to become famous as the London Aerodrome. In the same month he produced the "Baby Grahame-White," a 32 ft. biplane which was the subject of much discussion. This machine, by the way, was afterwards entered for the "Circuit of Britain" race, but on the morning of the contest the pilot declined to start.

To disprove the allegation that the machine was unsafe, Mr. Grahame-White himself made an ascent on it there and then, and after landing made a second flight with Lady Northcliffe as passenger.

FINANCIAL ESTIMATES.

With a view to the development of the London Aerodrome, the formation of a company was then announced, under the name of Grahame-White, Blériot, and Maxim, Limited. The capital was to be £200,000. The prospectus, which lies before me, was an interesting document, which was duly "slated" by the financial papers, on the ground that it contained an estimate of £10,000 as the annual gate receipts from the Aerodrome. Financial experts, however, are wise enough when dissecting the details of a going concern, but when it comes to gauging the prospects of a new movement they are hopelessly at sea, and I have a particularly lively recollection of an early example in the motoring era, when a certain flotation was unutterably damned as "having nothing to sell," whereas it proceeded to amass profits year after year, until it changed hands at a colossal figure.

As regards the item of £10,000 for the gate-money at Hendon, that sum was more than realised in the very first year. However, the City sceptics had their way; £53,000 was publicly subscribed, but was returned, because Mr. Grahame-White had fixed £75,000 as a necessary minimum. Consequently that company never



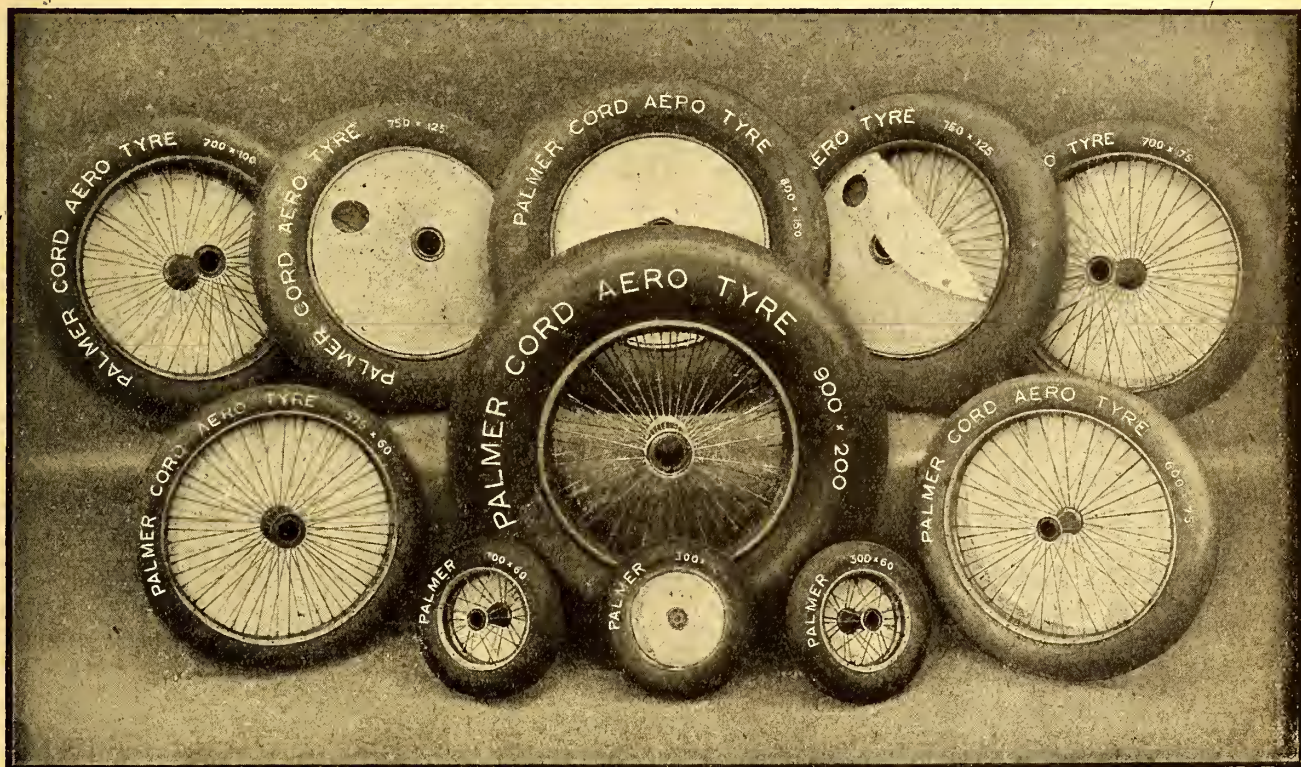
The late Flight Lieut. Richard T. Gates, Director of the Grahame-White Aviation Co., Ltd., and Manager of the successful London Aerodrome.



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300 x 60	16	111.12	25.4	Central	700 x 75	75	178.	31.75	132/46	750 x 125	33	150.	38.09	Central
"	17	72.39	12.7	Central	"	*80	178.	44.45	132/46	"	66	178.	38.89	132/46
450 x 60	30	89.	31.75	Central	"	*91	178.	31.75	132/46	"	96	178.	55.	132/46
575 x 60	14	150.	38.09	104/46	700 x 100	2	185.	55.	135/50	800 x 150	8	185.	55.	135/50
"	21	160.	28.	Central	"	4	185.	55.	Central	"	10	185.	55.	Central
"	34	150.	31.75	104/46	"	18	178.	44.45	132/46	"	+36	185.	55.	135/50
650 x 65	9	178.	44.45	132/46	"	26	150.	40.	Central	"	+40	185.	60.32	135/50
"	20	178.	38.09	132/46	"	33	150.	38.09	Central	"				
"	75	178.	31.75	132/46	"	66	178.	38.89	132/46	900 x 200	42	185.	60.32	125/60
600 x 75	14	150.	38.09	104/46	"	96	178.	55.	132/46	"	47	185.	55.	125/60
"	21	160.	28.	Central	750 x 125	2	185.	55.	135/50	1000 x 150	97	250.	65.4.	Central
"	34	150.	31.75	104/46	"	4	185.	55.	Central	1100 x 200	52	185.	55.	116/69
700 x 75	9	178.	44.45	132/46	"	18	178.	44.45	132/46	"	57	185.	55.	Central
"	20	178.	38.09	132/46	"	26	150.	40.	Central					

*Wheels Nos. 80 and 81 are fitted with a wider and stronger rim, and the 700 x 75 tyres when fitted to this rim caliper 83 m/m.

†Wheels Nos. 36 and 40 are of stronger type than the other wheels for 800 x 150 tyres.

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went to allotment, but its obligations were taken over by Mr. Grahame-White personally.

Mr. Grahame-White is anxious to pay tribute to the able assistance rendered him in the early, struggling days at Hendon by Mr. Guy Livingstone, the first Secretary of the Company (and now Lieut.-Colonel, R.F.C.); Mr. R. H. Carr, Mr. Grahame-White's chief mechanic, who accompanied him on both his American tours, and contributed largely to his flying success in all the international contests in which he competed (Mr. Carr is now Captain, R.F.C.); Mr. William Law, who maintained in such excellent repair the machines which were under his charge, and who is now chief of the construction department; Mr. Richard T. Gates, who joined the Company as a most energetic General Manager, and who was killed almost in the first days of the war while landing after a night reconnaissance over London, made as a result of an alarm being given that there were Zeppelins in the neighbourhood; Mr. T. Kemp-Walton, who has occupied the position of Secretary with unfailing industry and discretion for the last five years, and who has seen the Company through many vicissitudes; Mr. Thomas Ritchie, the Works Manager, who has assisted so materially in the development of the constructional side of the Company since the beginning of the war; and last, but by no means least, Mr. F. H. Payne, who, relinquishing his control of Olympia, Earl's Court, and other enterprises when these were taken over by the Government, stepped in a most timely way into the vacancy so regrettably created by the death of Mr. Gates, and who has played a large part in the recent extensive development of the Company's activities at Hendon.

FLYING PROGRESS.

It is not without interest, by the way, to recall the degree of aviation progress that had been made at this period. At the close of 1910 the distance record was Maurice Tabuteau's 362 miles; the duration record, Henri Farman's 8 hrs. 12 mins.; the speed record, A. Leblanc's 67½ miles an hour; and the altitude record, A. Hoxsy's 11,156 ft. In February, 1911, M. Lemartin carried seven passengers in a 4-seater Blériot, while in March, M. Sommer ascended with a round dozen.

In the spring of 1911 the development of the London Aerodrome and flying schools was undertaken with vigour, and if space permitted, one could enlarge almost indefinitely on this section of Mr. Grahame-White's activities alone. Suffice it to say that he has spent £8,000 on drainage alone at Hendon, and several thousands in the building of roads, while between 400 and 500 pupils had been trained at the Hendon Schools before the London Aerodrome passed into the hands of the military authorities.

PARLIAMENTARY MEASURES.

Meanwhile, he never ceased in his endeavours to impress the authorities with the importance of aviation from the national point of view. Attending before the Parliamentary Defence Committee at the House of Commons, he described the many uses to which the aeroplane could be devoted in warfare, and was laughed at when he stated that £1,000,000 should be devoted to the creation of an aerial army. Lord Charles Peresford said that there was one thing that an aeroplane could never do, and that was to drop bombs! To this Mr. Grahame-White replied that he had never tried it, but would undertake to do it forthwith; and, sure enough, when the Committee assembled a few days later at the London Aerodrome, he showed them how it could be done.

Among those who were present on that occasion was the Duke of Connaught, and a great number of Ministers and M.P.'s. Mr. Balfour and Mr. McKenna, among others, made ascents with Mr. Grahame-White on his Farman.

MAIL CARRYING.

The carrying of mails was another question in which he essayed to influence the authorities, and he succeeded to the extent of being allowed to conduct an actual service between Hendon and Windsor. No fewer than 130,000 letters and postcards were conveyed by air in strict official fashion, and among the many interesting souvenirs preserved at Hendon are the framed way-bills signed by the postmaster and countersigned by Mr. Gustav Hame! and Mr. Greswell as pilots. While writing of souvenirs, by the way, I may mention that Mr. Grahame-White has probably the largest private collection of aviation photographs in the world, comprising, as it does, over ten thousand prints.

ANOTHER AMERICAN TOUR.

In August of the same year a second American tour was undertaken, and proved highly successful. The machines used were a 70 h.p. Nieuport monoplane and a Farman biplane, and a large number of chief prizes were secured. The array of trophies, it may be added, in the entrance hall at Hendon is something to marvel at.

ATTRACTIONS AT HENDON.

The following year was one of perpetual activity at Hendon, and the City critics were more than ever confounded on the subject of the attractiveness of flying displays. At one meeting alone, as many as 60,000 people passed through the turnstiles. But, for that matter, scepticism has been defeated all along the line in every phase of aviation, and one wonders how anyone can have the hardihood henceforth to deny the possibilities of any-

thing under the sun once it has been established with a given scientific nucleus.

Among specially remarkable features of the Hendon programme was a series of night-flying demonstrations. Aeroplanes were illuminated by C.A.V. lamps, and mimic representations of warfare in the air were given, finishing with the bombing of a dummy battleship on the ground, thrown into strong relief by search-lights.

The London Aerodrome was also identified with many famous flying contests. It was the chief alighting point for the "Circuit of Europe," won by Lieut. de Conneau (otherwise André Beaumont), and was the first stage on the "Circuit of Britain" £10,000 race, also won by de Conneau; and it was the start and finish of the first Aerial Derby, the Hendon-Paris-Hendon and the Hendon-Manchester-Hendon races, the two latter being won by Mr. W. L. Brock on a Grahame-White-built Morane

FLYING IN SWITZERLAND.

In January, 1913, Mr. Grahame-White took a winter sports holiday at St. Moritz, and won a "bob" race the first time he mounted a bob-sleigh. Incidentally, it may be mentioned that he also took an aeroplane with him, and, with Mr. Louis Noel, made the first flight that had ever been witnessed at that popular 6,000 ft. resort, starting from the frozen lake.

In February he produced his first "warplane," and was the first man to mount a Lewis gun on an aeroplane. The machine was put through a course of trials at Bisley, piloted by Mr. Manton.

PARIS TO PUTNEY.

On June 26th, he carried out the flight already referred to from Paris to Putney on a Morane-Saulnier seaplane, leaving at 5.50 a.m., and arriving at 7.5 p.m. Before this time, however, the Government had promulgated new rules as to cross-Channel flights, and soon after his arrival at Putney, Mr. Grahame-White was asked by the Home Secretary, Mr. McKenna, how he had dared to land without permission. He replied that he had written in advance for the requisite authority, but having received no reply, he concluded that silence implied consent. The Home Secretary did not proceed to extremities, and nothing more was heard of the matter.

A DISPUTE.

Less happy was the ending of a dispute in October between Mr. Grahame-White and the Royal Aero Club. The Committee had disqualified M. Brindejonc des Moulinais, a Hendon winner, because he had infringed the law as to flying over prohibited areas. Contending that he ought to have been heard in his own defence, and that he was absolved when charged at Bow Street, Mr. Grahame-White resigned his membership of the Club, and from that day to this the breach has never been healed.

THE AERO 'BUS.

Among the machines produced at the Grahame-White factory during the period was the "Aero-Bus," with which M. Louis Noel set up a record, on Oct. 2nd, by carrying nine passengers on a flight of 19 minutes. Mr. Grahame-White also flew this machine across to Brooklands, with seven passengers, to witness Pégoud's "looping the loop," and it also secured the British Michelin prize on Nov. 6th, under the hands of Mr. R. H. Carr, with a distance of 300 miles.

HIGH SOCIETY.

A word in passing must be devoted to one feature of the London Aerodrome during its most popular period, and that is the extent to which Mr. Grahame-White enlisted the interest of the leaders of society in aviation. A list of distinguished passengers who made ascents at Hendon would almost suggest pages from Debrett or Burke; but without giving anything like a full list, the following, as given by Mr. Grahame-White, may be taken as typical:—"Earl Curzon, Sir Edward Carson, the Duchess of Westminster, Millicent Duchess of Sutherland, the Countess of Limerick, Prince Christopher of Greece, the Earl and Countess of Portarlington, Cora Lady Stratford, Lady Shelley, the Countesses Torby, Lord Desborough, Lady Juliet Duff, Lord and Lady Drogheda, Lady Victoria Pery, Sir Alfred Fripp, and Lady Rosemary Leveson-Gower."

TRANS-ATLANTIC AND OTHER SCHEMES.

A project to which Mr. Grahame-White has devoted serious attention is that of the trans-Atlantic flight. In 1913 he brought out an initial tentative design for a big machine, and was still developing his ideas when the war broke out. He is neither an optimist nor a pessimist on the subject of the great flight. That it is a big undertaking he fully admits, and one that would probably fail at the first attempt; he believes, moreover, that anyone who embarks upon the scheme will need to put down £50,000. All the same, he believes that the flight will become an accomplished fact, and will lead to definite passenger-carrying services. Incidentally, it may be mentioned that he entertains several novel ideas as to the most desirable type of machine. Nine-tenths of the development of the aeroplane of the future, he says, meaning thereby a big machine, will be concerned with the improvement of the motor itself. When the new designs of aerial turbines, which are now being evolved, have been perfected, and the engine reduced to one-quarter of its present weight, we shall see the dawn of the

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giant aeroplane as a long distance machine, capable of carrying even a hundred people. But along with the development of the motor should be combined a system of telescopic wings, so constructed that the supporting surfaces should never be greater than is necessary for horizontal flight. In other words, the wings should be of enormous area for lifting purposes, but when the machine is up they should adapt themselves to varying wind resistances by automatically folding up into a streamline hull, so that there would not be a square yard of surface more than would be necessary for sustained flight. Will this ideal be realised, one wonders, in the near future?

WAR SERVICE.

Be that as it may, the war put an effectual check on the development of Mr. Grahame-White's ideas in this connection. He joined the Royal Naval Air Service, and received a commission as Flight Commander for special service. In addition to advisory work in connection with the air defences of London, he made some of the first patrol flights by night over London, and once passed over Piccadilly at a height of 7,000 ft. He also took part in the first of the big air raids directed against the Belgian coast in February, 1915, and, on that occasion, had what was probably the most thrilling experience of his career. When several thousand feet up he encountered a violent snowstorm, which so over-weighted the planes of his 80 h.p. Farman that it became unmanageable, and he fell headlong into the sea. Fortunately, he was picked up by a French mine-sweeper and transferred to a British gun-boat.

THE HISPANO-SUIZA MOTOR.

The following notes are reproduced from "Aerial Age Weekly" (New York), of March 5th, 1917:—

The engine is the crux of the aeroplane problem. The Wright Co. was cognisant of the inadvisability of producing aeroplanes unless they could be equipped with a real modern engine, and it was obvious that it must manufacture its own. And to this end it acquired the Simplex Automobile Co., long builders of the highest grade automobile in this country embodying a standard of work comparable only with that necessary in a modern aeronautic motor.

The Company also acquired the rights for the United States and other countries for the Hispano-Suiza engine which is much lighter per horse power, and has given better results under test and at the front than any other aeronautical motor manufactured. These engines are now being produced at the Simplex plant of the Company in two sizes—150 and 75 h.p.

SIMPLEX MODEL "A" HISPANO-SUIZA.

The Model A is of the water-cooled four-cylinder Vee type, with eight cylinders, 4.7245 inch bore by 5.1182 inch stroke, piston displacement 718 cubic inches. At sea level it develops 150 h.p.

POST-SERVICE SERVICE.

Eventually he relinquished his commission in order to devote himself, with the Admiralty's approval, to the constructional work on war machines, which was already growing very rapidly at Hendon. Of the nature of subsequent developments in this connection it is impermissible to speak; but, at least, it may be said that they have proceeded on a scale that is literally stupendous. Meanwhile, Mr. Grahame-White is as earnest as ever in his desire to impress upon the British public that not only the future security of our Empire, but perhaps its very existence, will depend on our obtaining and then holding, an unquestioned supremacy in the air—a supremacy not only naval and military, but also commercial. British aircraft must, he contends, dominate the highways of the air in the same way that British shipping has dominated, and is dominating, the highways of the sea.

Whatever cry there may be for retrenchment after the war, money must be forthcoming for the development of flying, and the Government must not only find the money necessary for the creation of a great aerial fleet, but must be ready also to subsidise the first mail and passenger-carrying services by air, and to assist them in every practical way until they are established firmly on a commercial footing. Summarising Mr. Grahame-White's views as to the future, it may be said to be his contention that a dominion of the air will mean ultimately the dominion over land and sea.

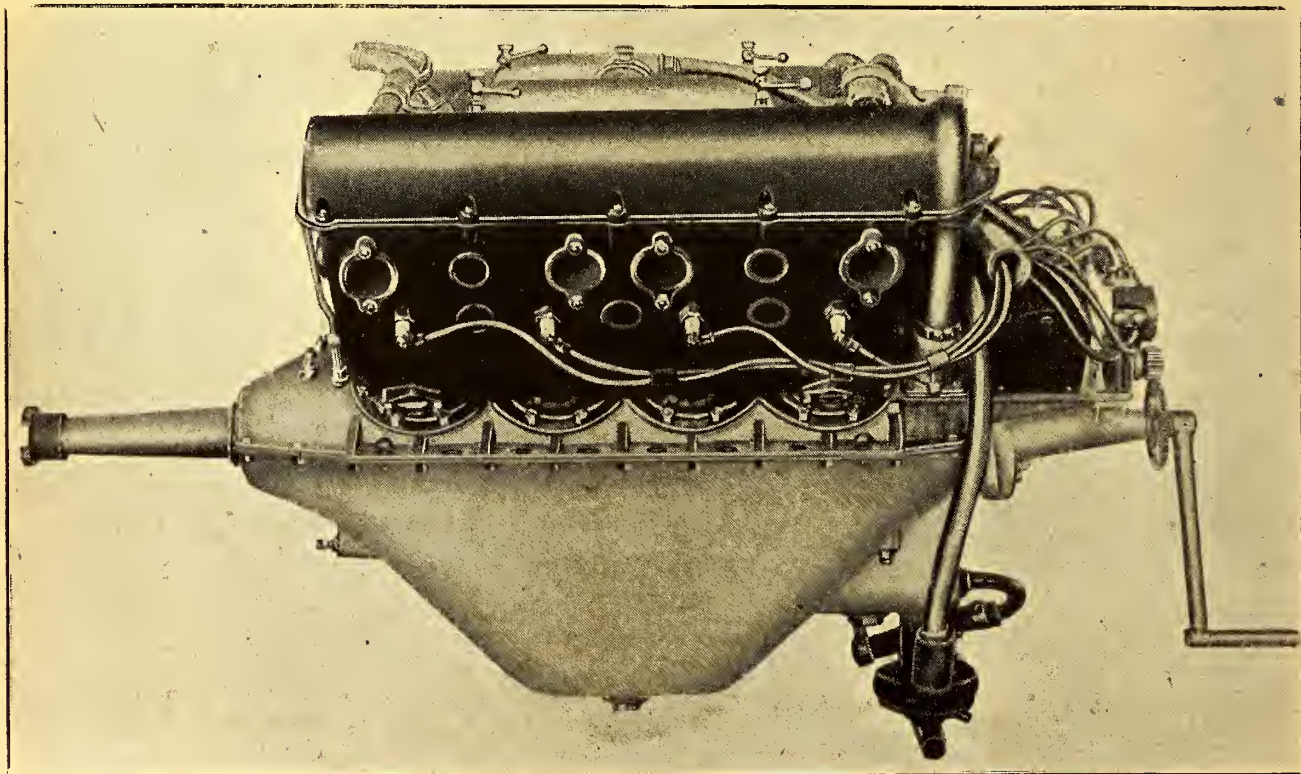
Finally, Mr. Grahame-White attributes the success which has attended his efforts to popularise flying very largely to the assistance which has always been rendered him so cordially by the Press, both technical and general.

at 1,450 r.p.m. It can be run successfully at much higher speeds, depending on propeller design and gearing, developing proportionately increased power. The weight, including carburettor, two magnetos, propeller hub, starting magneto and crank, but without radiator, water or oil or exhaust pipes, is 445 lbs. Average fuel consumption is .5 lbs. per horse power hour and the oil consumption at 1,450 r.p.m. is three quarts per hour.

Four cylinders are contained in each block, which is of built-up construction; the water jackets and valve ports are cast aluminium and the individual cylinders heat-treated steel forgings threaded into the bored holes of the aluminium castings. Each block after assembly is given a number of protective coats of enamel, both inside and out, baked on. Coats on the inside are applied under pressure.

The pistons are aluminium castings, ribbed. Connecting rods are tubular, of the forked type. One rod bears directly on the crank pin; the other rod has a bearing on the outside of the one first mentioned.

The crankshaft is of the five-bearing type, very short, stiff in design, bored for lightness and for the oiling system. The crankshaft extension is tapered for the French standard propeller



The 150-h.p. Hispano-Suiza Motor, from a photograph sent by the Wright-Martin Aircraft Corporation, who are manufacturing the engine at the Simplex Works.

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hub, which is keyed and locked to the shaft. This makes possible instant change of propellers. The case is in two halves divided on the centre line of the crankshaft, the bearings being fitted between the upper and lower sections. The lower half is deep, providing a large oil reservoir and stiffening the engine. The upper half is simple and provides magneto supports on extension ledges of the two main faces.

The valves are of large diameter with hollow stems, working in cast iron bushings. They are directly operated by a single hollow camshaft located over the valves. The camshafts are driven from the crankshaft by vertical shafts and bevel gears. The camshafts, cams and heads of the valve stems are all enclosed in oil-tight removable housings of cast aluminium.

Oiling is by a positive pressure system. The oil is taken through a filter and steel tubes cast in the case to main bearings, through crankshaft to crank pins. The fourth main bearing is also provided with an oil lead from the system and through tubes running up the end of each cylinder block, oil is provided for the camshafts, cams and bearings. The surplus oil escapes through the end of the camshaft where the driving gears are mounted, and with the oil that has gathered in the top casing, descends through the drive shaft and gears to the sump.

Ignition is by two eight-cylinder magnetos firing two spark-plugs per cylinder. The magnetos are driven from each of the two vertical shafts by small bevel pinions meshing in bevel gears. The carburettor is mounted between the two cylinder blocks and feeds the two blocks through aluminium manifolds which are partly water-jacketed.

The engine can be equipped with a geared hand crank starting device.

SIMPLEX MODEL "B" HISPANO-SUIZA.

The Model "B" has four cylinders of the same bore and stroke as the eight, displacement 350 cubic inches. It develops 75 h.p. at 1,450 r.p.m. and can be run at higher speeds. The weight is 315 lbs. This engine is in all respects similar to the larger size, save that it has, of course, no forked connecting rod, has four-cylinder magnetos, and the water-circulating pump is differently mounted.

"THE JOY STICK."

One of the most outstanding phenomena of the war is the desire that has arisen in all ranks of society to commit both fact and fiction to paper, and a species of epidemic has arisen, regardless of the shortage of lamp oil, paper, or ideas. Every infant school seems to have its house magazines, and in more enterprising establishments where instruction is given to small boys of any age over nine the practice seems to be to have opposing journals in every form, sometimes produced in the worst handwriting, and occasionally turned out on a super-annuated typewriter. Practically every ship in the Navy and every regiment in the army perpetrates its weekly or its monthly "rag" devoted to local interests and local scandal and occasionally to local grousing. The R.N.A.S. and the R.F.C. have also been smitten by the complaint, and the invective perpetrated by the editors of some of their best efforts is only excelled by the organs of the Submarine Service.

The Aircraft Industry has not been behindhand in cultivating the latest microbe, and in many cases its efforts have produced better journalism than one finds in any except the best regular newspapers. It has been one's pleasure to review several of the Trade productions such as "The B.P." (the House magazine of Boulton and Paul, Ltd., Norwich) and "The Olympian" (of Blackburn's, Leeds) and "Aircraft Supplies" (of the Aircraft Supplies, Ltd.). A. V. Roe and Co., Ltd., of Manchester, have lately joined the glad throng and have instituted a journalistic production which they call "The Joy Stick." Although this monumental work has only reached its fourth fortnightly number, it can claim a circulation of 1,000 copies. Starting with a modest four page duplicated "folder," "The Joy Stick" has now attained the dignity of 16 pages, as well as a very artistic cover, and Mr. George Webster, the Editor, is to be congratulated.

"The Joy Stick" conforms to what seems to have become unwritten law in the production of a local magazine by the inclusion of a scandal page, with various and assorted "digs" at various members of the Avro conspiracy, the allusions of which are patent only to the initiated.

The Editor is writing some Avro Milestones, being a short history, in serial form, on the progress of the Avro firm. These articles are most interesting, and as a retrospect they make one reflect deeply upon the faith that made it possible for the Roe Brothers to carry on in spite of official discouragement.

Number 3 of "The Joy Stick" states that it has been passed by the censor and approved by the A.I.D., but, nevertheless, one sincerely trusts that someone will strafe the magazine poet.

The Editor will be pleased to exchange copies of "The Joy Stick" with the Editor of any other of the Trade magazines who cares to communicate with him, and also with the various squadron magazines of the R.N.A.S. and R.F.C. Strangers who are interested are invited to send three stamps for a copy of the magazine. One will certainly look forward with pleasure to the arrival of further editions, which cannot fail to improve fortnight by fortnight.—W. L. W.

MATERIAL AND DESIGN IN AEROPLANES.

The above were the subjects dealt with on Thursday evening last at the Aeronautical Society's fifth lecture at Cricklewood.

The lecturer on this occasion was Mr. E. O. Boswall, A.F.Ae.S., the chair being taken by Lt.-Col. Bagnall-Wild, R.F.C. (Chief Inspector, A.I.D.).

Mr. Boswall said that the marked development of late years in methods of construction and design must be credited to the fact that experimental information, aided by practical experience, had brought aeroplane construction up to the same degree of certainty as applied to other forms of engineering constructional work. One of the chief difficulties, however, was, he said, that strength formed only one qualification in aeroplane construction and laid considerable emphasis on the fact that lightness or economy in material was an equally important factor, and as the materials employed presented many variable features, this last condition necessitated the adoption of special care, not only in the selection of suitable material, but also in the utilisation of that material to the best possible advantage.

Mr. Boswall devoted the first portion of his lecture to wings or planes, including control surfaces, i.e., tail plane elevators, etc., explaining the method of arriving at the plane area a necessary for the type of the machine under construction, and the proper disposition of the various parts of the machine.

The lecturer here made use of some excellent lantern slides of skeleton diagrams, showing the main points in the construction of an aeroplane, and the strains undertaken by the planes, struts, and bracing wires, explaining, in connection with the latter, how the incidence wires, although in the ordinary way taking practically no load, and not being so considered in a preliminary design, became of considerable importance should a flying wire give way, in which case the front or back spar load, as the case might be, would, through the medium of the incidence wires, be transmitted to the back or front spar respectively, and the machine might still be capable of maintaining its flight although, of course, with a much reduced factor of safety.

The form of structure adopted in regard to the fuselage, and the essential features of under-carriage construction, were also carefully explained, particular attention being given by the lecturer to the methods of shock absorbing adopted.

In dealing with the question of materials the lecturer pointed out that the very nature of an aeroplane demanded that the materials used should possess a maximum of strength with a minimum of weight in addition to the very essential property of being able to resist, without suffering permanent distortion, the sudden stresses and strains to which aircraft are always liable to be subjected both while in the air and when landing, and for this reason, he said, wood forms the most convenient material, and, in conjunction with light forms of metal in the form of tubes and plates, is the basis of most aeroplane constructional work.

Mr. Boswall thought, however, that with the development of the large type of machine it was possible that steel might eventually replace wood to some extent in the future.

The question of the qualities of the different kinds of wood employed in aeroplane construction, and the method of seasoning the same, were discussed.

The different kinds of steel employed were also dealt with at some length by Mr. Boswall, and it was shown by diagrams how, when a piece of steel is tested, it is found that the alteration in length is exactly proportional to the load up to what is termed the "elastic limit." Passing this point, a slightly more rapid change in length occurs up to a point termed the "yield point," when the steel begins to behave as though it were plastic, and pulls out rapidly with very little increase in the load. This rapid change having ceased the alteration of length with increase of load becomes again slower until finally the specimen breaks at what is termed the "ultimate or breaking load."

Mr. Boswall also gave some interesting information on the subject of single and stranded wires and cables, and the methods adopted in forming the terminal fastenings thereto. It was necessary, he explained, to pay great attention to terminal fastenings as they were a most important source of weakness, the efficiency varying from about 70 per cent. in the case of simple eye bend and oval coiled wire ferrule used with solid wires, to 90 per cent. or 95 per cent. in the case of loop or thimble adopted for cable, wherefore the possible strength of the fastening had to be taken as the criterion of strength. It was also pointed out that an essential feature in regard to all wire and cable details is that of rapid repair in the field.

The lecturer regretted that the time available would not permit him to go into the characteristics of the other various materials which enter into the construction of an aeroplane.

I do not know whether my remarks in regard to a previous lecture of this series have had effect, but at any rate Mr. Boswall wisely refrained from overwhelming his audience with a mass of involved mathematical calculations, for which restraint he has my sincere thanks.

Owing to the vast amount of ground which had to be covered the lecturer occupied rather a longer time than usual, and this, no doubt, accounted to a great extent for the very meagre discussion which followed.

The proceedings were brought to a close by a very humorous little speech by the chairman and a hearty vote of thanks.—H. H.



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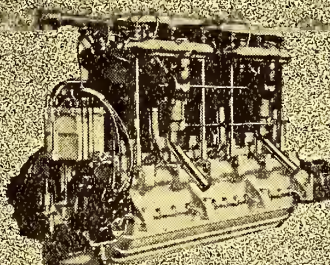
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Notes on Speed Indicators for Aeroplanes.

THE PITOT TUBE.

By WINSLOW H. HERSCHEL, of the Bureau of Standards.

(Reproduced from "Aviation," New York, Jan. 15th, 1917.)

There are two dangers which an aviator must guard against by the use of a speed indicator. Too low a speed may lead to stalling; that is, the speed is so low that the weight of the aeroplane is not sustained, and on the other hand too high a speed may cause excessive stress and possible breakage. The speed indicator must be independent of the engine, because it is in gliding, with the engine still, that excessive speed is most likely to occur. On this account no form of engine tachometer can fulfil the purpose of the air speed meter.

Speed indicators, in general, consist of two parts, the head which receives the impact of the relative wind, and the gauge, which must be placed within view of the pilot. It is important that the head should be placed sufficiently far from the body so that it will not be influenced by eddy currents, and a position near a wing-tip seems preferable. Even when so placed, it must be remembered that the disturbance produced by a body

types. We shall deal with the Pitot tube now, and reserve consideration of the Venturi tube to a later article.

THE PITOT TUBE.

In the Pitot tube the head consists of a dynamic opening pointing directly into the current, and a static opening at right angles to it. If the two openings are connected to the two sides of a U-tube manometer containing a liquid of density, ρ , while the density of the air in which the Pitot tube is placed is ρ , the velocity of the air may be obtained from the formula

$$V = C \sqrt{\frac{2ghd}{\rho}} \quad (1)$$

where h is the head shown on the manometer, g is the acceleration of gravity, 32.17 feet/seconds squared (9.81 meters/seconds squared), and C is a coefficient to be determined by experiment. In the case of a Pitot tube used on an aeroplane, V would be the velocity of flight.

It has been shown by Rowse* that with proper care in the design and use of the Pitot tube, C may, for all practical purposes, be taken equal to unity. To give correct readings, the static tube must be constructed with great care, though almost any form of dynamic opening will give good results. The dynamic tube must be pointed directly against the current, which is not possible when there is turbulence, and there must not be rapid variations in velocity, as the velocity calculated from the average head, indicated by the gauge, is not the true average velocity.

It has been claimed by some experimenters that a different value of C was obtained according to whether the tube was calibrated by moving it through still air or placing it in a current of moving air, but Fry and Tyndall† have shown that for velocities above 11 miles an hour (17.7 kilometres) both methods of standardisation gave the same result. This shows that if the tube is of a form found by tests in moving air to have a coefficient of unity, then the coefficient C in Equation 1 may be taken equal to unity when calibrating a speed meter by moving it through still air, by means of an automobile or on the aeroplane itself.

If C is taken equal to unity, Equation 1 may be written

$$V = K \sqrt{\frac{h}{\rho}} \quad (2)$$

and values of K taken from Table I.

TABLE I.
VALUES OF K FOR EQUATION 2.

h measure in:	ρ measured in:	V measured in:	K
Inches of water at 20° C. (68° F.)	Pounds Feet ³	Feet per second Miles per hour	18.28 12.46
Minimum of Water at 20° C. (68° F.)	Kilograms Meters ³	Meters per second Kilometers per hr.	4.426 15.93

To calculate the air density, ρ , the following quantities must be known or assumed:—

B = the barometric pressure.

t = the temperature of the air.

P = pressure of saturated steam at t deg., from the steam tables.

H = the relative humidity.

Then, in English units, if B and P are in inches of mercury, and t in degrees F.,

$$\rho = 1.327 \frac{B - 0.376 P H}{460 + t} \text{ pounds/feet}^3 \quad (3)$$

or in metric units, if B and P are in millimetres of mercury, and t in degrees C.,

$$\rho = 1.464 \frac{B - 0.376 P H}{273 + t} \text{ kilograms/meters}^3 \quad (4)$$

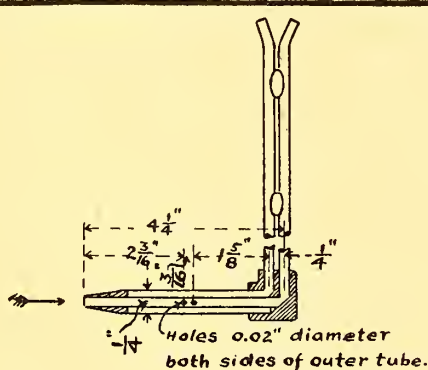
The calculations required by Equation 3 may be avoided by the use of diagrams given by Rowse and by Taylor.‡ Hinz§ gives a diagram showing the gas constant of moist air which may be used in place of Equation 4.

* W. C. Rowse, Transactions American Society of Mechanical Engineers, 1913, page 633.

† J. D. Fry and A. M. Tyndall, "Philosophical Magazine," 1911, page 348.

‡ D. W. Taylor, Society of Naval Architects and Marine Engineers, Nov., 1905, page 39 and plates 33 and 34.

§ A. Hinz, Thermodynamische Grundlagen der Kolben und Turbo-kompressoren, page 42.



EXAMPLE OF A PITOT TUBE USED BY ROWSE, DESIGNED BY THE AMERICAN BLOWER COMPANY

passing through the air extends some distance in front of it. On account of the considerable distance between the head and the gauge, the connection between them should be easily changed in length without causing a change in the indications of the instrument, as otherwise, if the instrument were applied to another make of aeroplane, a new graduation of the gauge might become necessary.

While, strictly speaking, all types of speed indicators, with the exception of the rotary anemometer, have to be pointed directly into the wind in order to give correct readings, the angle between the relative wind and the direction of flight would be so small, in the case of a high-speed aeroplane, as not seriously to invalidate the readings of the indicator. It is therefore possible to fix the head permanently in the direction of flight, which avoids the undesirable complication of mounting it on a wind vane. It would be desirable, however, to mount the instrument so that it could be tilted when the angle of incidence was changed, as otherwise a greater error might be introduced than would be caused by the absence of a wind vane.

As an aeroplane does not always remain in an upright position, any instrument should be constructed so as to be independent of the effect of gravity, and if so designed, it would also be independent of the effect of vertical acceleration.

In the great majority of cases the determination of true velocity is of secondary importance, so that it is practically no objection to a speed indicator if correction has to be made for air density when the true velocity is desired. On the other hand, it is an important advantage if no correction has to be made to the readings in order to find the relative sustaining power.

The principal types of speed indicator, which are to be considered with respect to their fitness for aeroplane conditions, are the rotary anemometer, pressure plate, Pitot tube, and Venturi tube. Speed indicators of the true anemometer type, such as the Robinson anemometer used by the Weather Bureau, are affected little, if at all, by changes in air density.

A speed indicator adapted for aeroplanes is made by Wilhelm Morell, of Leipzig, by combining a Robinson anemometer with a tachometer of the centrifugal pendulum type. Such an instrument should be very serviceable if used primarily to determine velocity rather than safety in flight.

The pressure plate is objectionable on account of the large head resistance, and the necessity of having a rigid connection between the head and the gauge. There is also considerable doubt as to the extent that the indications of such an instrument are affected by differences in air density. If pressure plates and rotary anemometers are omitted from further consideration, the Pitot tube and Venturi tube remain as the most important

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The above equations and table give all the data necessary to calibrate a Pitot tube. If the gauge is correctly graduated, and the apparatus is in good order, the head calculated from the observed velocity by means of Equation 2 should agree with the observed head, allowance being made for the difference between the air density during test and that assumed by the maker of the instrument.

In considering the error due to changes in air density, Darwin* makes the usual assumption that there is a fall of 1 deg. F. for every 300 ft. (0.61 deg. C. per 100 metres) rise above the earth's surface. He gives Table 2 showing velocities indicated by a Pitot tube manometer, the actual speed being at all times 100 miles (161 kilometres) per hour.

Height.		Speed Readings.		Speed Readings.	
Feet.	Meters.	Temperature Constant.	Miles. Kilometers.	Falling with Height.	Miles. Kilometers.
0000	0000	100.0	160.9	100.0	160.9
1000	305	98.3	158.0	98.6	158.7
2000	610	96.5	155.3	97.1	156.1
3000	914	94.7	152.3	95.7	154.0
4000	1219	93.0	149.8	94.3	151.8
5000	1524	91.3	147.0	92.9	149.7

While the errors shown by the table are considerable, it should be remembered that the safety against stalling is the same for a given manometer reading, whatever may be the density of the air and the consequent error in the readings as an indication of actual velocity.

Taking the weight of a cubic foot of air as 0.0715 lbs. (1.145 kilogrammes/metres³), Equation 2 gives a head of 1.15 inches (29.2 millimetres for a speed of 50 miles, or 80 kilometres, per hour), which shows the desirability of magnifying the manometer reading. On account of the rocking of the aeroplane, this could not be done by using inclined columns of liquid such as are conveniently employed under other conditions. Some advantage may be derived from the use of a differential gauge, and it is claimed for a manometer of this type, especially designed for aeroplanes, that the error is only 1.5 per cent. when the manometer is 10 deg. out of the vertical.[†]

It is thus apparent that the problem with the Pitot tube is to make a satisfactory gauge, without the use of liquids, which shall be sufficiently sensitive to give the required open scale readings at velocities approaching the stalling speed, and must also be durable enough not to suffer from vibrations and shocks experienced in landing.

* H. Darwin, "Aeronautical Journal," July, 1913.

† "Deutsche Luftfahrer Zeitschrift," Aug. 6th, 1913, page 386; "Aeronautical Journal," July, 1913.

THE USES OF STEEL.

On Wednesday, April 11th, 1917, a paper will be read by Lt.-Col. R. K. Bagnall Wild, R.E. (Chief Inspector, A.I.D.), at a meeting of the Institution of Automobile Engineers, to be held in the hall of the Royal Societies of Arts, John Street, Adelphi, W.C.2. The chair will be taken at 8 p.m. The subject of the paper is "The Use and Abuse of Steel in Aircraft Construction," a topic of vital interest to the aircraft industry, and it is earnestly to be hoped that a large and representative gathering will attend. Tickets may be obtained from the Institution of Automobile Engineers, 28, Victoria Street, Westminster, S.W.1.

CELLON DEVELOPMENTS.

Though at the moment one may not give details, it is known that very considerable developments are taking place in the affairs of Cellon, Ltd. This firm has always been notable for the uniform high quality of its products, and the natural result has been a steady and rapid increase in its business. Various extensions have been made in the premises from time to time, but one gathers that the latest development is bigger than anything which has been done hitherto. Mr. A. J. A. Wallace Barr deserves every congratulation on the way in which he has in a few years built up a great business from small and somewhat inauspicious beginnings, and one hopes that the latest development may be only another step towards still greater successes.

THE B.P. WORKS MAGAZINE.

The March edition of the "B.P. Works Magazine" is well up to the standard which has so steadily been maintained since its inception, and it is difficult to say much more in praise than has been said before.

The portrait of the month is of Mr. Stanley Howes, a manufacturer of Norwich, who is co-operating with the firm of Boulton and Paul, Ltd., in their war output.

The clever series of letters from a munition worker are continued, and so is the article on the History of Artificial Flight, and the competitions' page is of interest to all good mechanics.

The first of a series of articles on the Relationship of Capital and Labour presents an interesting aspect to a most controversial topic and one looks forward with interest to future articles on this subject.

A QUESTION OF DEFINITION.

Mr. René Desoutter, the well-known test pilot, takes exception to a statement made in THE AEROPLANE last week that the Procter Isaac Aircraft Company are "the only regular firm" of aeroplane testers in the world. As a matter of fact, this statement is literally correct, as a firm essentially consists of more than one partner associated in the firm's work. In justice to Mr. Desoutter and other test pilots, such as Messrs. Raynham, Barnwell, and others, however, it may be well to point out that they have been engaged upon aeroplane testing for a considerable time, and have done much work of high value in improving aeroplanes.

AN UNFORTUNATE ERROR.

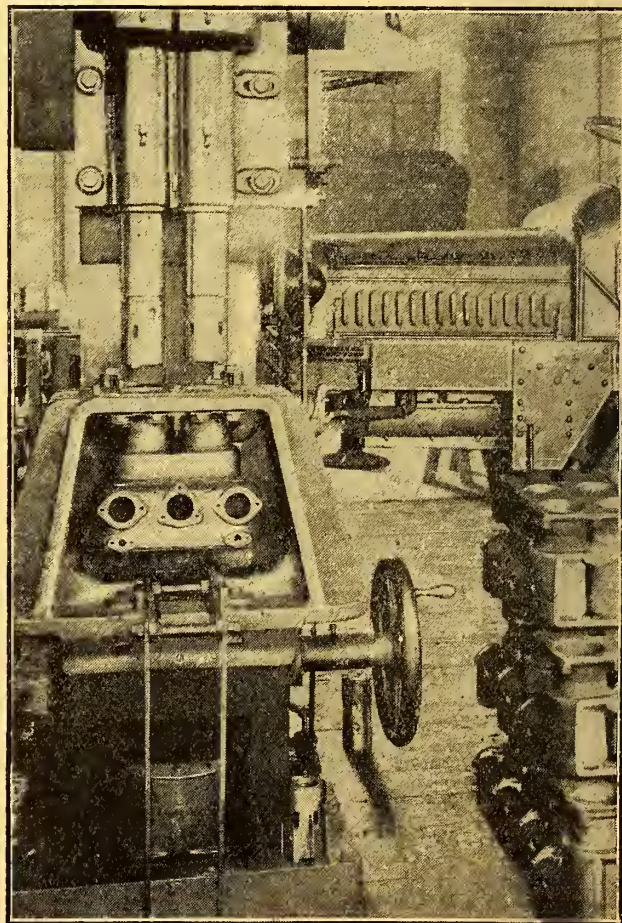
An unfortunate printer's error appeared in AERONAUTICAL ENGINEERING last week in the letter on Streamline Wires and Cables signed "Naze." The writer was then made to say, "It is quite impossible to make cables which would give much better results under the working conditions, higher breaking strains, cheaper prices, and, what is of more value at the present time, greater output." This should have read "It is quite possible" to carry out the improvements indicated. Naturally this puts quite a different complexion on the latter part of the writer's arguments.

SUBMARINES AND SEAPLANES.

The "Scientific American" for March 10th discussed the possibility of aerial aggression on the part of Germany against America in the event of war breaking out between these countries. It points out that the width of the Atlantic makes the likelihood of aerial raids direct from Germany extremely improbable, but suggests the possibility that German submarines of the "Deutschland" class or even larger might be employed to carry specially packed seaplanes within a few miles of the American coast, and states that a large cargo-carrying submarine might easily carry four or six useful seaplanes complete with necessary supplies.

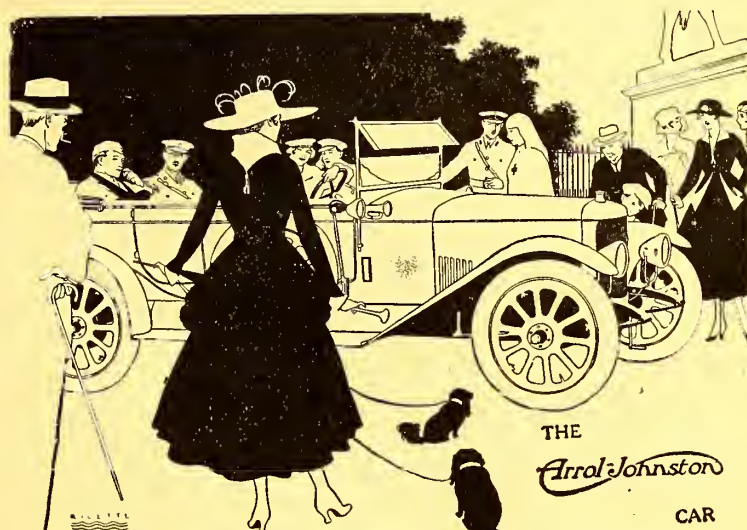
The voyage across the Atlantic could then be made submerged, and the seaplanes erected on the surface just out of sight of land, the submarine taking its chance to get everything clear before it was caught by enemy cruisers. A sufficiently annoying raid might then be made by the seaplanes, which would with luck eventually be picked up by the submarine. The chief criticism that can be made against this proposal is the very small result which could be obtained in proportion to the high cost and the great risk of non-success. The suggestion is ingenious, but one which does not seem likely to be adopted by the Germans.

[One seems to remember a seaplane-carrying submarine evolved by a certain Mr. Pemberton-Billing quite a long time ago.—Ed.]



A Twin boring machine for motor-cylinders, in the Thomas Aero-engine Factory at Ithaca, New York.

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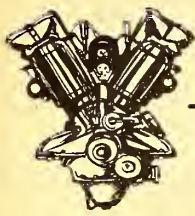


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AERO-MOTORS

IN KIND AND CONSTRUCTION

By Geoffrey de Holden-Stone



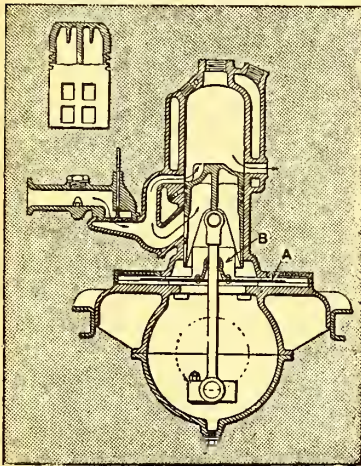
THE COMPROMISE THAT FAILED.

Nothing in motor-design is more interesting, more restraining, and withal more irritating than the historical part of two-stroke practice. That is to say, the vast amount of all that has been done or proposed in it. Try to devise something new, retaining the advantages—such as they are—of conventional types, and then see where the design you had in mind finishes. If you be wise you will finish with it early, from quite another ideal, and break wholly away from the conventional type. Then you may possibly find that the “advantages” slip in automatically,

often accompanied by others you had never considered, much less schemed for.

I had a comparatively cheap lesson of this kind nearly twelve years ago. With a view to getting rid of crank-chamber-compression vices and troubles, while retaining the shortness of the Day-type, I did what seemed to be the only possible thing. That was, to work out a design for enclosing the connecting-rod in a halved horizontal slide-block with a trunnioned oscillating bush or gland, as shown.

The result looked quite pretty and effective on paper. I had the sense to keep it there. For later consideration of the



An idea which was tried and failed, but which was revived later.

absolute necessity for the most perfect machining in the first place, and then of the certainty that the whole of it would be rapidly destroyed by the complicated thrusts that must have occurred, soon decided me to abandon the idea, with neither flowers nor regrets.

The quaint part of the business was that four years after I had forgotten this failure, I saw the self-same device actually reproduced in cold metal as the latest product of a famous Billancourt firm! But I never heard that they wasted any time over more than that single example.

THE LUCAS AND THE SCOTT TYPES.

Again—so did that illusion of shortness beset the efforts of those days—there was, and still exists, the notable Lucas design: and likewise that high development of the Day-type produced by Scott of Bradford, one of the most ingenious and original exponents of two-stroke design. Now the mechanical details of both, as well as their working principles, are too well known to call for any special description. Suffice it that both are well able to contradict any idea that a two-stroke motor, as such, cannot develop high speeds or maintain its efficiency.

I can at least vouch for this, that the Lucas, for one, is as smooth running and flexible a motor as any six-cylinder four-stroker I ever sat behind: literally a marvel in the thickest of London traffic. On the other hand, the successive victories of the Scott twin-cylinder on the Isle of Man course—which is probably the most searching and difficult in the world—leave no room for anything but appreciative praise.

Still, the manifest necessity for placing the Lucas motor transversely in the chassis—like the original 14-h.p. Motobloc and the first Brooke motor—obviously limits it to a single pair of cylinders: and thus—even for motor-car use—seems to place it at a theoretical disadvantage which disappears in the purely motor-cycle duplication of the Scott model.

But obviously, for this reason alone, either—or any possible development of that type of two-stroker—would be practically out of court as an aero-motor proposition.

AN UNIDENTIFIED EXAMPLE.

Again, at the Aero Show before last, Mr. A. V. Roe exhibited—though he did not happen to invent it—a clever little motor which—albeit using crank-chamber compression, certainly did seem as if it would work as well as, or better than, the purely Day-type.

One feature of this motor was that instead of the usual charge transfer ducts or passages, it had flutings or grooves formed in the piston trunk, which coincided with others machined inside the lower wall of the cylinder, and thus formed a series of transfer ducts, individually small, but combining to a considerable aggregate for a remarkably free induction.

The other feature was the annular baffle formed on the top of the piston head, *well inside its circumference*, to form a deflector for the incoming charge. Here, in my opinion—as will later on be evident—efficiency was just missed because that baffle-ring was inside the piston-head circumference.

Actually, it had all the disadvantage of spilling the charge so evident in the Day-type. For with the exhaust ports in a circle, in the usual place, it will be obvious that the charge was merely spilled backwards out of these, instead of across, in the manner already so clearly illustrated. For in no way did that deflector ring guard those exhaust ports.

AND ITS POSSIBILITIES.

On the other hand, much might well have been gained if the upper half of the annular baffle had been brought out to the same diameter as the piston-trunk—so as to cut out the exhaust ports completely at full-piston outstroke—while its lower half was waisted inwards, and freely ported, so as to form an annular induction passage in free communication with the series of induction grooves, at full outstroke. Even so, all the disadvantages of crank-chamber compression would have been still to overcome!

Still, it was a practical design, and essentially a commercial one as it stood. With the suggested detail variation, too, it would probably have shown far greater efficiency than any pure Day-type.

THE LEGROS TYPE AND ITS DEFECTS.

All of which is distinctly to seek in another on the list of two-stroke efforts—which I only mention as an historical example of ingenuity misapplied in a very costly fashion. This was the René Legros—no connection with the “Iris” four-stroker’s designer—a motor which we used to see regularly at the Salon de l’Automobile, but, somehow, never anywhere else.

This one had its pistons trunnioned into the heads of two connecting rods, on either side, and the pistons were thus enabled to compress the charge down upon a sort of hollow pillar or stationary piston. Thus, compressed primarily, the charge passed into a horizontal distributor—very much like that of the Darraq design of recent years—which was originally chain-driven, but latterly rotated by gearing from the crank-shaft, at even speed.

There was nothing to prevent this motor running; but it will be evident to the merest amateur of two-stroke design that, apart from its necessarily excessive height in proportion to the actual piston-travel, its extra weight, and the wear on vital parts, the whole design was so complicated that its production would cost more for no better result than the average four-stroker would show.

A ROTARY-RADIAL SUGGESTION.

However, for a rotary or a radial motor, there is probably something in the system of trunnioning the pistons to duplicated connecting-rods. Especially with a crank-chamber and induction system modelled after the Gnome *monosoupape* fashion: i.e., to a ring of induction ports from an annular transfer. Of the two, the radial would offer the more practical proposition for a two-stroker, in this case. And no serious difficulty would be found to occur in the lubrication of the heads and big-ends of the connecting-rods, if their encasement was made integral with, or even detachable from, the two halves of the crank-chamber.

The only trouble would be to avoid, in the design, making the motor nothing more than a rotary or radial Day-type. But this, I imagine, would be best got over in the manner suggested in the previous case: i.e., by the waisted annular exhaust-guard and charge-deflector. Mechanically, the design would be much simpler than that of any four-stroke rotary or radial, with the additional advantage of being absolutely valveless.

On the other hand, not only as a striking contrast to the René Legros, but superior from many standpoints of motor quality to the majority of its predecessors in the two-stroke field, we have the type invented by Mr. J. C. Mort, of Acton, W. In this model, the feature is that the entire operation of primary induction and compression transference and force-fed distribution to two, four, or even six cylinders is effected by a gear-driven modification of the Roots blower.

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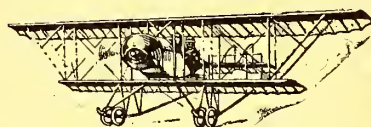
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At the same time, while the height of the motor is as low as that of any Day-type, the crank-chamber has the same function as in a four-stroke motor, and no other.

THE MORT TWO-STROKER.

Now, to be hypercritical, this blower-device does somewhat encumber the mass of any vertical model, thus spoiling that naked appearance which, properly enough, is the classic two-stroke ideal. But in a V-type, either an eight or a twelve, it would lie snugly enough at the bottom of the V-trench, and draw from a carburettor at either end. Also its spindle could couple up direct—and most conveniently to magnetos similarly mounted. At any rate, one can hardly imagine a more compact V-type; and if the record of the Mort verticals of a few years back is any criterion, it should give a tremendous amount of power for its size and weight.

This aspect, however, is somewhat conditional on the exact physical results, which do not appear to have been publicly recorded. Without knowing for certain, I have always understood that the petrol consumption of the Mort two-stroker was very light. All that is definitely known is that its mechanical excellence and reliability under very severe conditions were very clearly shown in the case of Mr. Ogilvie's Wright biplane in the Gordon-Bennett race at Eastchurch, throughout which his Mort motor never missed a stroke.

Actually, the only question, in my opinion, is whether under the suddenly varied conditions of Service aviation that blower-device would give such good results; or whether mixture backlash would be set up. In a V-type, at any rate, I should not imagine that the slightest uncertainty of re-starting after cutting out would exist. On the contrary I should expect absolute reliability in this essential matter, whatever else happened or did not happen. But—the Mort design, unless altered from the original, in which the pistons were of the conventional Day-type, would naturally be subject to the same defect of mixture wastage into the exhaust; all the more rather than less, because of the slightly force-fed induction from its characteristic blower.

(To be continued.)

GERMAN ENGINEERING FROM WITHIN.

Mr. Sidney Smith, of Pipe Motors (England), and formerly of the Sheffield Simplex Co., has contributed an interesting article to a recent number of the "Monthly Review of Modern Machine Shop Practice," which is published by Alfred Herbert, Ltd., the famous machine tool firm, of Coventry.

The subject of the article is "German Engineering from Within," and it was written in the light of experience gained by the author during three years' experience in a German engineering works—as a matter of fact, at the Metallurgique Motor Car factory in Berlin, a branch of the Belgian firm.

Mr. Smith occupied the important post, to use the German's idea of the right English expression, "chief konstrutor"—actually, chief designer. Mr. Smith says:—

The factory was splendidly equipped, from a plant point of view, clean as a new pin, and as orderly as a row of them on a card. Every German is automatically orderly, clean and methodical; he learns that in the Army, and his work and results show it in the factory. It is a mistake to speak of "dirty" Germans, unless referring to their morals or minds. It was not that we had an abnormal number of cleaners and labourers about, but the men themselves kept order. Nothing was ever lying about that was not being actually worked upon.

The interesting feature of Mr. Smith's impressions is the curious personal interest of the average German workman in the welfare of the firm as a commercial proposition. He would, on occasion, go out of his way to save the firm time and money, even when it benefited himself but indirectly.

Everything that could be jigged was jigged, but there was never any tool-room finish on the jigs, they were just accurate, and very often the idea and work of the mechanic himself "to cut down time." Think of it, the men themselves laboured and strove to cut down the time so that goods might be produced cheaper!

One does not blame the British workman for wanting to make all the money he can at the moment, but there is no doubt that if at times he used a little more foresight it would pay him well. In the palmy days of peace a business enterprise may be made a success or a failure according to the loyalty or disloyalty of the men, and in normal times, with its surplus of labour, the closing-down of a factory is a very serious thing for the operatives.

Mr. Smith gives a concrete example of one of many hundreds of cases of the kind with which he met.

Our clutches were internal expanding metal to metal ones. I forget the assembly piece-work price, but the man who did this work called me one day to see an assembly jig he had designed and made with the approval of his foreman. He had rigged it up out of bits of odd steel and bolts, and cut the time of assembly in half. As to money, he asked for and was given, say, three marks, where he had previously had five, and the firm saved two. He made more money and got additional work to do, and his productive power was increased about 50 per cent.

Further, Mr. Smith says:—

How is restricted output to stand against this? How are we to stand up against it except by copying these very wise proceedings and beating their brains—which is not difficult?

Please do not imagine Berlin workmen were badly paid. Work was abundant and the money good.

They were out to beat Britain and the other countries in the markets of the world, and intelligent co-operation, goodwill, and give-and-take amongst them was very rapidly doing this, owing largely to our myopic methods.

Later again he says:—

It is the output that counts—the number of things you sell and get the money for—and well these Germans know it, from the most stupid of directors down to their shop-boys.

Fixed rates and methods—well, we had none. Methods were there as starting points, to be improved from day to day, and costs cheapened. All strove for this from above downwards; nay, I will say from below upwards; but, and this is important, the men were treated generously, as a whole.

The men were regarded as colleagues by those above, and not as mere machine-minders or fitters to be hired at a given rate, and driven. Of course, the whole thing resolved itself into one of "attitude of mind."

Commenting on the introduction of improved methods of production, a matter on which the British workman is always suspicious on account of possible reductions in piecework prices, Mr. Smith says:—

There was a note of thoroughness and mutual help and interest all through the factory.

For instance, a difficulty would arise, and those concerned would discuss it on the spot; the workman, or men, doing the actual work would join in, and very often it fell to their first-hand knowledge to suggest a solution.

The foreman did not resent the man's joining in, he welcomed and expected it, and many times have I seen that really the only two men in the discussion were the chief and the workman concerned. Decisions arrived at in this manner are usually right, because they have a firm foundation on the underlying facts.

On the question of German versus British workmen, taking each on their merits, Mr. Smith says:—

Man for man, in brains and initiative, our men can beat them all along the line, but I fear the German is generally more industrious, keener on his job, broader in his views, more determined to succeed and supply exactly what is wanted, be he workman, foreman, staff official, manager or director, and more alive to the value of mutual trust and help.

On the matter of labour-saving machinery, Mr. Smith says:—

The cry in Berlin was for machines, always machines, and more machines, anything to cut cost and speed up output, and when the firm had not the money the banks provided it.

On the all-important difference between British and German financial methods, as operated by banking firms, Mr. Smith says:—

In Germany, the banks usually have a director on the board of big concerns, and take an intelligent interest in all their clients. They back orders and opportunities as fast as they come along and can be obtained. They provide money or credit for material and up-to-date plant, and share in the resulting profits from the orders executed.

They don't ask to see twenty shillings before backing to the extent of ten. They merely use their intelligence, and require to see orders and opportunities.

Our existing methods are a tremendous handicap to our engineers in competing with Germany. Ready capital or bank credit mean material to go at, at the right moment, up-to-date plant, good deliveries and good terms to offer customers.

There is not the slightest doubt that many a leaf can be profitably drawn from the German's notebook. He has done much to teach us how to produce an air service and a colossal army. We have derived much instruction from him regarding the employment of frightfulness and the logic of war, and to refuse to crib manufacturing tips from him would be criminal.

Doubtless Mr. Smith's frank admiration of German business methods will make him unpopular among manufacturers of what he himself calls "our old invincible 'my father did it before me' type, to be met with in such abundance in England," but his open and unprejudiced statements should be of high value to the young generation of manufacturers and works managers whose mission in life it is, or should be, to oust these old fossilised manufacturers from the pinnacles of success on which they have been placed by their fathers' methods.

Manufacturers of the newer type should be particularly grateful to Alfred Herbert, Ltd., for daring to publish an article which is sufficiently honest to earn the epithet of "pro-German" from the average Englishman, but Alfred Herbert's have ever been in the front rank—or a bit in front of that—where brains and intelligence are concerned, at any rate since the influx of new blood into the firm with Mr. Oscar Harmer some 20 years ago.

One recalls incidentally that Gnome engines only became a manufacturing proposition after, or perhaps because, Alfred Herbert's designed special machines with which to machine the cylinders and other special parts.

MORE PROOF!

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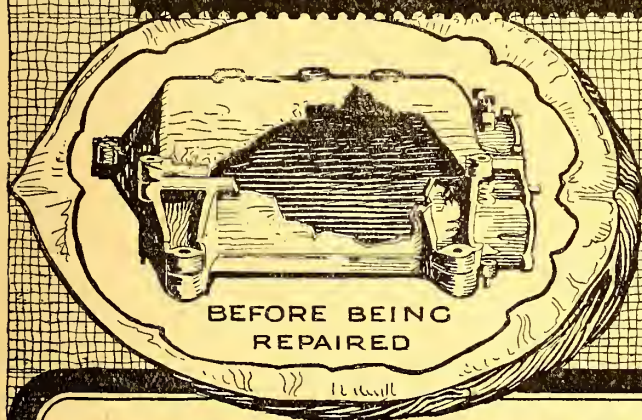
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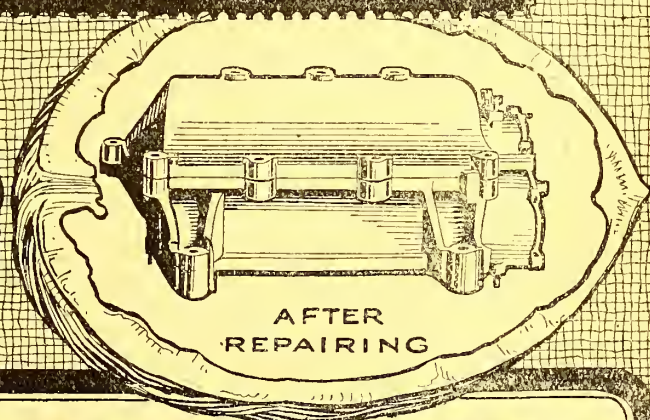
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MARKET REPORTS.

PRICES GIVEN ARE FOR QUANTITIES ON USUAL TERMS.

Monthly Summary.

COPPER.—The Copper market is a little easier than it was at the beginning of March.

The Government Control of Copper Stocks, and Scrap Materials, has now become more stringent this month, and this fact, together with the economies which are being insisted on, is undoubtedly having a beneficial effect upon prices.

At the beginning of the month, the tendency of the market in U.S.A. was upward due primarily to the political situation, the position is now, however, becoming easier.

This month's Prices.	Feb. 28.	Mar. 7.	Mar. 14.	Mar. 21.	To-Day.
Standard Copper ...	£139	£136	£136	£136	£136
CASH TERMS.					
Copper Sheets	£172	£174	£174	£174	£174
Copper Tube	20½d.	20½d.	20½d.	20½d.	20½d.
Brass Tubes	17½d.	17½d.	17½d.	17½d.	17½d.
Brass Sheet	16½d.	16½d.	16½d.	16½d.	16½d.

STEEL.—There has been no diminution of enquiries sent to Sheffield during the past month, and the mills are choked with orders. The tables are turned, Steel firms no longer seek for orders, but the consumers are busy endeavouring to place business and secure deliveries. Buyers are learning to anticipate their requirements of all classes of Steel; Mild, High Tensile, Cast, High Speed, etc., etc., and are placing their orders months in advance.

This month has witnessed practically a cessation of deliveries of Steel from U.S.A. The prices quoted by American firms are totally prohibitive.

During the month, there has been very little fluctuation in prices, and there does not appear to be the slightest hope of the market becoming easier at present.

Average Prices, R.A.F., 3A Steel, 48s. to 52s.; R.A.F., 1E Steel, 82s. Basis, plus Tests. R.A.F., 9A, Sheet Steel, 28s. to 29s. 6d.

Official Prices, High Speed, 14 per cent. Tungsten, 2s. 10d. lb.; High Speed, 16 per cent. Tungsten, 3s. 4d. lb.; High Speed, 18 per cent. Tungsten, 3s. 10d. lb., Basis.

ALUMINIUM.—Since the beginning of the month, official control of Aluminium has become more stringent; it is not expected that this will influence the price, but it should certainly result in larger quantities of material being available for national needs.

The Official Prices are as follows:—Ingots, £22½ D/D; Sheets, 19G, 2s. 10½d. lb.

TIMBER.—The outlook has darkened, and the position is becoming very acute.

Owing to cessation of shipments arriving in this country prices are rapidly advancing. This cessation is due to business reasons and must not be attributed to submarine warfare.

Prices:—Spruce, 13s. 6d. to 14s. 3d. c.f.; English Ash, 12s. to 13s. c.f.; Walnut, 2s. 6½d. s.f.; Mahogany (log), 1s. 10d.; Mahogany (plank), 1s. 11½d. to 2s. 1d. s.f.

FABRIC.—Another month has passed and manufacturers still wait for the official prices to be fixed for Fabrics.

It has become exceedingly difficult to procure Indian and Egyptian Tapes in substantial quantities, and manufacturers who use these materials should anticipate their requirements. The same remarks apply to Webbing.

COMPONENT PARTS FOR AEROPLANES.

Aircraft constructors should note that a new factory for the production of aircraft components has been opened at Kingston-on-Thames by the Swift Aeronautical Engineering Company. The proprietor of the firm is Mr. J. C. Wilson, who has had long practical experience in the engineering industry, dating back to the early cycle days. The writer's first recollection of Mr. Wilson dates back to 1895, when he was foreman of the tandem shop at the Coventry Machinists Co., Ltd., and was responsible for the output of the Swift tandems, triplets, and quads which were in their time world-famous. Before that time he was with the old Rudge Co., prior to the Rudge-Whitworth formation. Since then he has been engaged to a considerable extent upon aircraft work, and for a period held a responsible position with Martinsyde, Ltd., so that he is fully qualified to undertake sub-contracts for aircraft parts. The firm is well equipped with tools for the production of both wood and metal parts, a speciality being made of such fittings as spar boxes and struts. Inquiries should be addressed to the firm at 41-43, Richmond Road, Kingston-on-Thames.



This list is specially compiled for THE AEROPLANE by Rayner and Co., Registered Patent Agents, 5, Chancery Lane, E.C.

PATENTS APPLIED FOR.

- 4195. Blackburn Aeroplane and Motor Co. Adjusting-means for tension members of aerial machines. 23/3/17.
- 4189. A. J. Liversedge. Airships or dirigible balloons, etc. 22/3/17.
- 4226. C. C. Morley. Synchronising-gear for machine-guns of aeroplanes. 23/3/17.
- 4069. C. Prost. Flying machines. 20/3/17.
- 4238. J. Robson. Aeroplanes. 23/3/17.

SPECIFICATIONS ACCEPTED THIS WEEK.

- 104,708. J. J. Jackson. Flying machines.
- 104,747. T. N. Lupton, sen., and T. N. Lupton, jun. Mechanical wings for aircraft.
- 104,769. H. O. Short. Dirigible balloons or airships.

SPECIFICATIONS PUBLISHED THIS WEEK.

- 104,346. C. A. Johannsson. Stabilisation of aircraft.
- 104,386. Marconi's Wireless Telegraph Co., and H. M. Dowsett. Aeroplanes fitted with wireless telegraph apparatus.

LATEST PUBLISHED ABSTRACTS.

- 103,400. Aeroplanes. A. A. Holle, Bisham Lodge; A. W. Judge, "Summerfield," Ashley Road, both in Thames Ditton, Surrey, and Varioplane Co., 34, Gresham Street, London.

The aerofoil described in Specification 15,290/15 is modified so that, as the upper surface of the entering edge is raised and the trailing part flexed downwards, the nose of its entering edge is depressed. The mechanism for depressing the nose comprises a bell-crank lever pivoted to a plate, one arm of the lever being connected to the spar forming the rigid member of the nose, and the other arm to the mechanism for varying the position of the tail and the upper surface of the plane. A link connects the lower part of the coupling-plate to the plate.

Printed copies of the published specifications and abstract can be obtained from Messrs. Rayner and Co., at the price of 1s. each.

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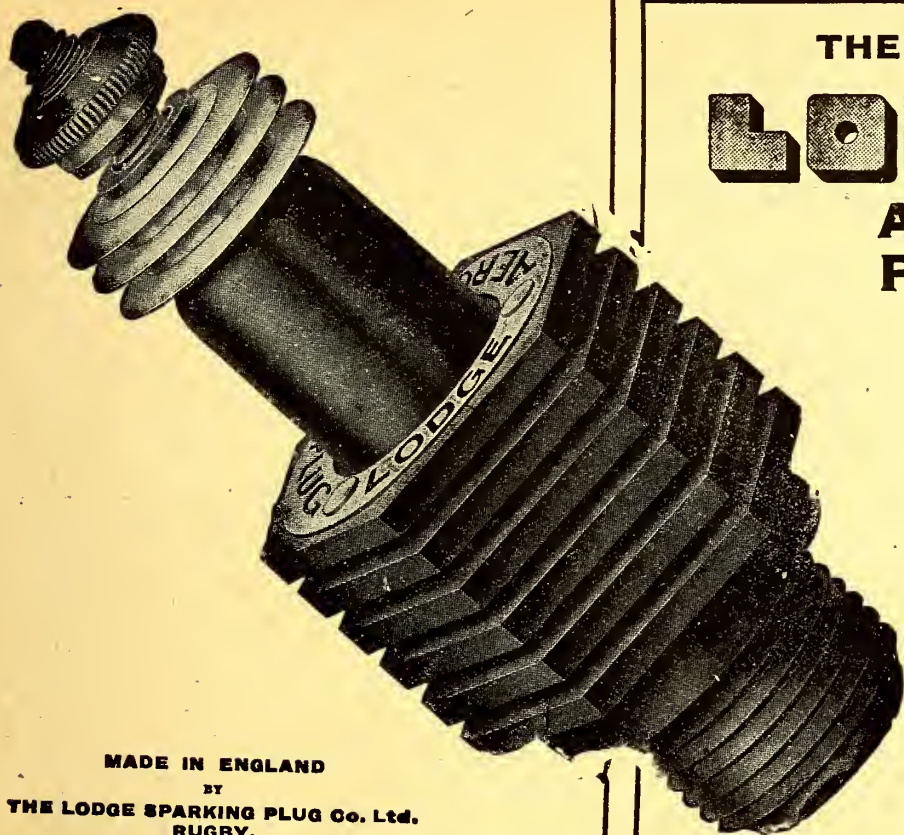
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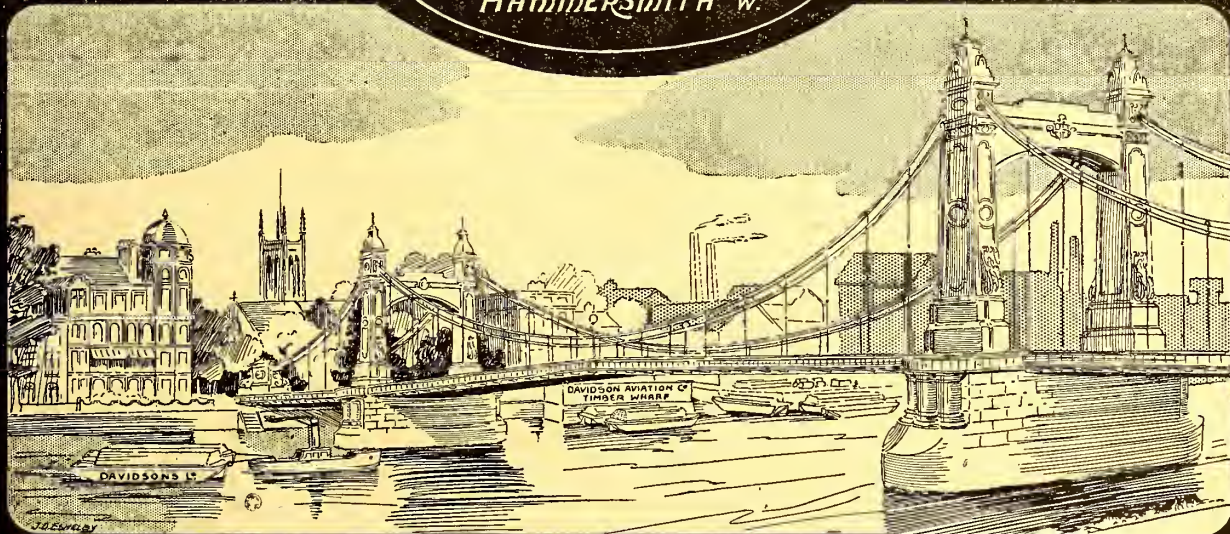


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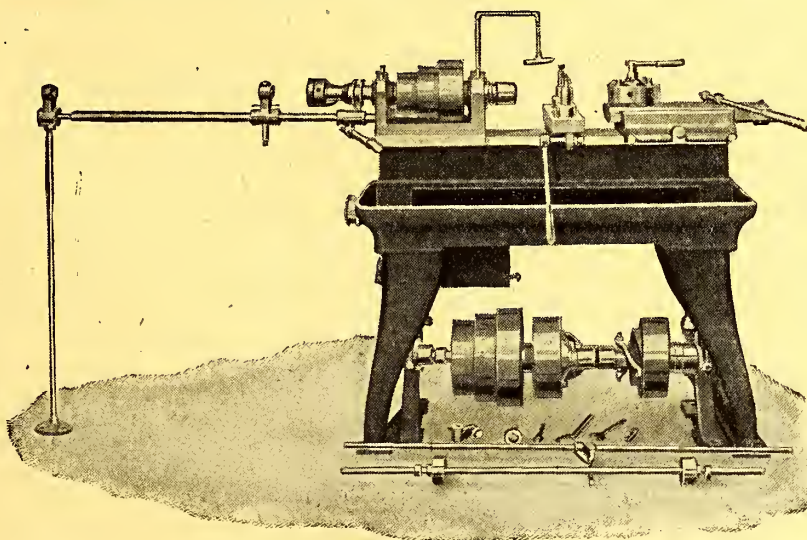


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(Continued from page 848.)

machines; and, if so, to what reason are these accidents attributed; whether it was intended to employ these machines upon active service against the enemy; and, if not, for what purpose were they ordered?

Major Baird: Contracts for the aeroplane referred to have been placed at various dates, but it is not desirable to publish the numbers of machines ordered or delivered. Several fatal accidents have happened to pilots flying this machine, the majority of which have been attributed by the Courts of Inquiry to some error of judgment on the part of the pilot. The machine is not an easy one to fly, but its qualities render it of great value for service in the field, where it is now employed in considerable numbers. The possibility of structural alteration in the type is receiving the fullest consideration.

NAVAL OFFICERS' INVENTIONS.

On April 2nd **Mr. Billing** asked the First Lord of the Admiralty the names of the officers of the R.N.A.S. who had designed the aeroplane or seaplane which had been successfully employed against the enemy?

Dr. Macnamara: Wing-Commander Porte, R.N.

EXPERIMENTAL WORK.

Mr. Billing asked the First Lord of the Admiralty, in view of the new Order of the Ministry of Munitions made under the Defence of the Realm Act prohibiting firms from proceeding with any experimental work unless they have the direct sanction of the Ministry of Munitions, if he will state what is the position in these circumstances of the firm which is now doing experimental work for the Royal Naval Air Service?

Dr. Macnamara: The supply of all aeroplanes and seaplanes

and experimental work in connection therewith are under the direct control of the Air Board and the Ministry of Munitions.

Mr. Billing: Are airships of the Royal Naval Air Service also under that control?

Dr. Macnamara: I will consider it if the hon. gentleman will put a question down.

ATTACKS ON ZEEBRUGGE.

Mr. Billing asked the First Lord of the Admiralty whether his attention has been drawn to the results obtained by the Royal Naval Air Service on the enemy submarine bases at Zeebrugge?

Dr. Macnamara: Yes, Sir.

Mr. Billing: Are they satisfied that these reports show the maximum amount of damage and the maximum number of raids which have been carried out?

Dr. Macnamara: I am not going to answer that.

Mr. Billing: The information for which I am asking the right hon. gentleman is what we have done in the past? Surely that may be given.

Mr. Speaker: Is there any use asking if they are satisfied? Nobody in this world is ever satisfied.

ROYAL NAVAL AIR SERVICE (COMMANDS).

Mr. Billing asked who is in supreme command of the Royal Naval Air Service squadrons stationed at Dunkirk?

Dr. Macnamara: I am not prepared to give particulars of the various Commands.

Mr. Billing: May I ask whether the officer who is responsible for initiating raids is stationed at the Admiralty, or where the squadrons are operated?

Dr. Macnamara: That is the sort of information I am not disposed to give.

Mr. Billing: May I ask the right hon. gentleman to see that the officer stationed at Dunkirk has a freer hand?

OFFICERS' CASUALTY LIST.

Mr. Churchill (by Private Notice): I wish to ask the Under Secretary of State for War whether his attention has been drawn to the fact that the casualty list appearing in this morning's papers contained the names of 63 officers killed or missing, and of this total for the whole of the Army no fewer than 31 are aviators of the Royal Flying Corps; and whether any explanation can be given of this remarkable disproportion?

The Under Secretary of State for War (Mr. Macpherson): I received notice of this question only a few minutes ago, and I will have inquiries made. I think that the probable explanation of the apparent disproportion is that it is a casualty return covering several days of what we know to be severe and intense fighting by the Royal Flying Corps.

Mr. Churchill: Can my hon. friend say whether, as a matter of fact, there has been an increase in the number of casualties among the Royal Flying Corps during the last month?

Mr. Macpherson: I must have notice of that.

Mr. Jynson-Hicks: Even if these figures represent a few days, will they not be far in excess of the percentages which the hon. gentleman gave us last week?

Mr. Macpherson: All I can say is that the fighting has been extremely intense during the last few days, and that the number of our Flying Corps officers employed has been greater than before.

Sir Henry Dalziel: Can the hon. gentleman say whether the proportion of casualties at home within the last fortnight has been greater than it has ever been before?

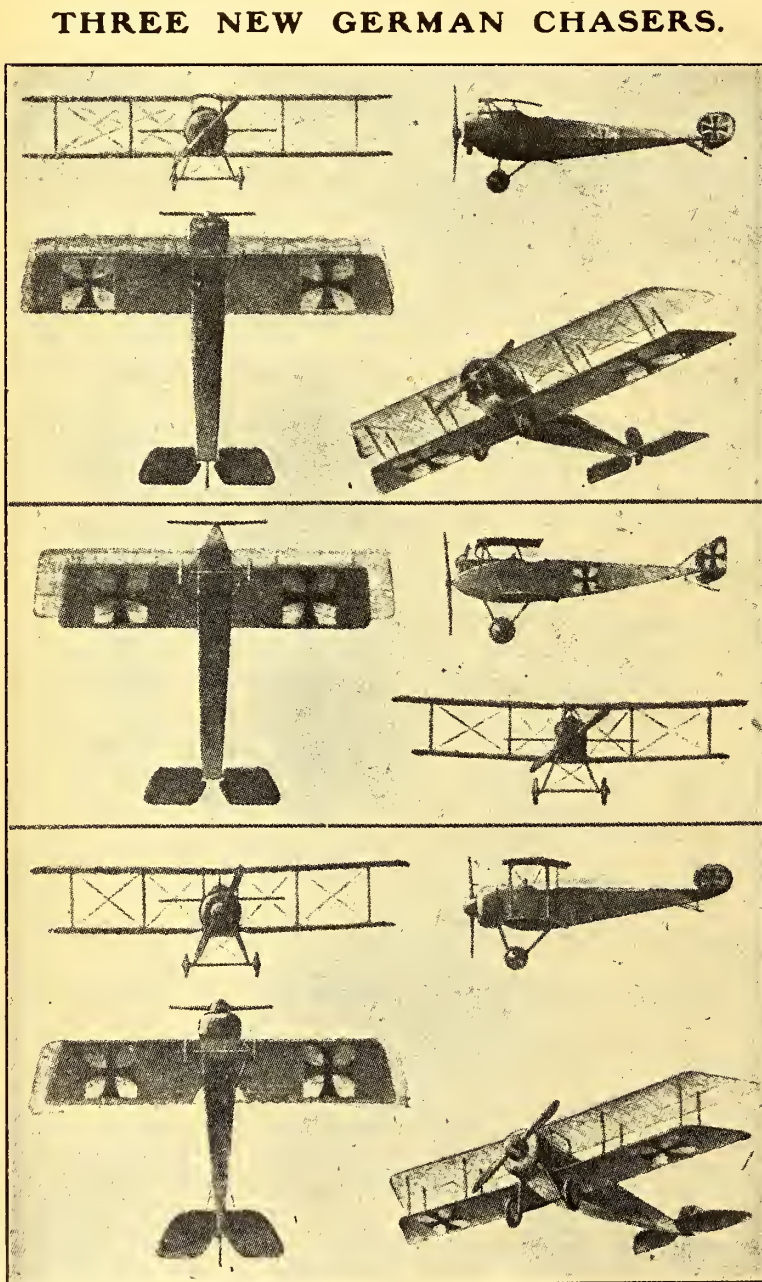
General Scheme for Recognition.

ABOVE.—The FOKKER BIPLANE (1916-17) now on service. Equal wings. No "arrow," and no dihedral. Wings staggered, and arched in centre section. Kidney-shaped rudder. Morane-type elevators. Fuselage tapering horizontally, as in the Morane. Motor, Oberursel rotary, or fixed Mercedes.

CENTRE.—The HALBERSTADT. (1916-17). Wings staggered. Lower plane slightly shorter in span than upper. No "arrow," but slight dihedral. Rudder and elevators of Morane type. Motor, fixed Argus.

BELOW.—The AGO. (1916-17). Wings vertical, not staggered, and of same chord. Lower plane almost equal in span to upper. No "arrow," slight dihedral. Ailerons projecting on the slant beyond the wing-shape proper. Elevators and rudder of Nieuport type. Motor, Oberursel rotary.

Drawings and Description by M. Jean Lagorgette.



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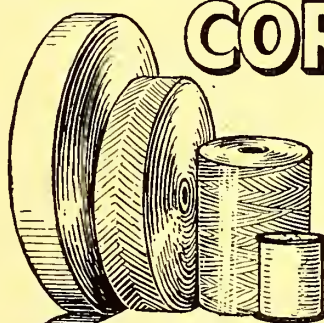
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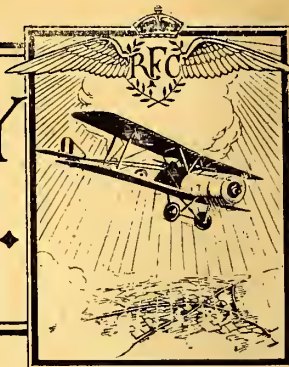
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NAVAL *and* MILITARY • AERONAUTICS •



THE "LONDON GAZETTE."

It has been decided that in future excerpts from the "London Gazette" will be confined to promotions to field rank or higher, to staff appointments, to special promotions for services in the field, and to honours and decorations.

In the early days of the war when people who had already flown were being appointed to junior ranks it was of interest to chronicle appointments and promotions in all ranks. Now, however, by far the greater portion of the "Gazette" is occupied by the names of young officers who have yet to distinguish themselves. It is therefore felt that, in view of the shortage of paper, it will be in the best interests of aviation that the space hitherto so occupied shall be devoted to matter of more general concern.

Officers recently gazetted will find their appointments in the "Times" newspaper, as also their earlier promotions. One hopes that the Lord Northcliffe will not resent this unavoidable incitement to raise the circulation of his distinguished publication under present circumstances. One fears also that the diligent Hun who, presumably, is told off to keep a ledger account of appointments and losses in the Flying Services will have to sort out the further additions for himself, so that this paper has probably made yet another enemy for life.

Nevertheless, it is hoped that the extra space which will thus become available for information and illustrations may be so used as to reconcile readers to the loss of the names of our future Generals and V.Cs. in their first manifestations.—Ed.]

From the "London Gazette," Friday, March 30th, 1917.

WAR OFFICE, March 30th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Park Comdrs.—Sec. Lt. (temp. Capt.) S. S. Kennedy, Spec. Rés., from an Equipment Officer, 1st Cl., and to be temp. Maj. whilst so empld., March 1st, 1917. Capt. G. Adams, S. Lan. R., from a Flt. Comdr., and to be temp. Maj. whilst so empld., March 14th, 1917.

* * *

From the "London Gazette" Supplement, March 31st, 1917.

WAR OFFICE, March 31st.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Sqn. Comdrs.—From Flt. Comdrs., and to be temp. Majs., whilst so empld.:—Capt. J. L. Jackson, M.C., Conn. Rang., Spec. Res., Oct. 2nd, 1916. Sec. Lt. (temp. Capt.) W. H. D. Acland, M.C., Yeo., T.F., Dec. 1st, 1916. Sec. Lt. (temp. Capt.) H. S. Shield, M.C., N. Staff. R., Jan. 7th. Sec. Lt. (temp. Capt.) the Hon. O. M. Guest, Yeo., T.F., Jan. 25th.

FROM THE COURT CIRCULAR.

BUCKINGHAM PALACE, March 28th.

The following Officers had the honour of being received by the King, when His Majesty conferred decorations as follows:—

THE DISTINGUISHED SERVICE CROSS.

Flt. Lt. Edward Grange, R.N.A.S.

THE MILITARY CROSS.

Sec. Lt. Frank Varcoe, R.F.C.

* * *

BUCKINGHAM PALACE, March 31st.

The following officer had the honour of being received by the King, when His Majesty conferred upon him the Military Cross.

Sec. Lt. James McCudden, R.F.C.

NAVAL.

THE CASUALTY LIST.

Reported March 28th.

DIED.—Graham, Flt. Lt. (Sub-Lt., R.N.) Henry D., R.N.
ACCIDENTALLY INJURED.—Smyth, Flt. Sub-Lt. Gabriel, G. H., R.N.
MISSING.—Woolley, Lt. Duncan B., R.M. (R.N.D., attd. R.F.C.)

Reported March 29th.

ACCIDENTALLY KILLED.—Walker, Flt. Sub-Lt. F. C., R.N.
PREVIOUSLY MISSING (BELIEVED A PRISONER), NOW A PRISONER.—Elliott, Flt. Sub-Lt. George L., R.N.

Reported March 30th.

ACCIDENTALLY KILLED.—Oliver, Flt. Sub-Lt. William S., R.N.
DIED OF INJURIES.—Harvey, Prob. Flt. Sub-Lt. Arthur F., R.N.
BELIEVED PRISONER.—Beare, Flt. Sub-Lt. Sidney G., R.N.

Reported March 31st.

SERIOUSLY INJURED.—Preston, Flt. Sub-Lt. Kenneth B., R.N.
PREVIOUSLY MISSING, NOW A PRISONER.—Smith, Flt. Sub-Lt. Lewis E., R.N.

Reported April 3rd.

ACCIDENTALLY KILLED.—Primrose, Lt. Walter W., R.M. (R.N.D., attd. R.F.C.).
MISSING.—Owen, Sub-Lt. Horace W., R.N.V.R. (R.N.D., attd. R.F.C.).

PERSONAL NOTICES.

DEATH.

GRAHAM.—Flight Lieut. (Sub-Lieut., R.N.) Henry Davenport Graham, R.N. (killed), was the elder son of Harold J. Graham, C.E. (Cooper's Hill), late P.W.D., New South Wales, and Mrs. Graham, and grandson of the late Lieut. Henry Davenport Graham, R.N. He was born in 1896 and entered Osborne in 1909. At the outbreak of war he was midshipman in the "Centurion," and in 1915 was selected for special service with airships. He was in 1916 promoted sub-lieutenant. The same year he went abroad. He was promoted flight lieutenant in the New Year Honours List, and about the same time qualified for aeroplanes. It was while serving with the latter he met his death.

ENGAGEMENT.

EDMONDS—OSBORN.—The engagement is announced of Squadron-Commander C. H. K. Edmonds, D.S.O., R.N., son of Mr. and Mrs. Charles Edmonds, of Lymington, Hants, to Lorna Karim Chadwick Osborn, daughter of Colonel George Osborn, Royal Artillery, and granddaughter of the late Robert Chadwick, J.P., of Sydney, N.S.W.

MILITARY.

G.H.Q. COMMUNIQUÉS.

MARCH 29th, 8.22 p.m.—Two German aeroplanes were driven down in a damaged condition yesterday as a result of fighting in the air.

Three of our machines are missing.

MARCH 31st.—Successful work was carried out by our aeroplanes yesterday in spite of unfavourable weather. One hostile machine was driven down out of control. Two of our machines are missing.

APRIL 1st.—There was considerable activity in the air yesterday, and a number of fights took place. Two German aeroplanes were destroyed and three others driven down. One of our machines is missing.

APRIL 2nd, 9.5 p.m.—One hostile aeroplane was brought down yesterday in air fighting. One of our machines is missing.

* * *

WAR OFFICE COMMUNIQUÉS.

The General Officer Commanding the British Forces in Macedonia reports:—

MARCH 30th.—Our aircraft have been active and on one occasion drove off an enemy squadron which was endeavouring to carry out a bombing attack on our communications.

* * *

THE CASUALTY LIST.

Reported March 28th.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—

Johnson, Sec. Lt. P. C. E., R.F.C.

WOUNDED.—Kirby, Sec. Lt. H., E. Kent Regt., attd. R.F.C.

MISSING.—Bertie, Capt. C. P., Royal Field Artillery and R.F.C.

Elgey, Sec. Lt. E., R.F.A. and R.F.C.

Fair, Sec. Lt. J. G., Yeomanry and R.F.C.

Purves, Sec. Lt. S. S. B., Yeomanry and R.F.C.

KILLED.—R.F.C.—Chambers, 18096, 2nd Air Mech. (Khargpar, India).

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Reported March 29th.

DIED OF WOUNDS.—Elphinstone, Maj. M., A.S.C., attd. R.F.C.
 WOUNDED.—Benbow, Lt. E. L., M.C., R.F.A., attd. R.F.C.
 Stocks, Sec. Lt. S. J., S. Lanes. Regt., attd. R.F.C.

INDIAN FORCES.

KILLED.—Baxter, Lt. F. O., M.C., I.A. Res., attd. R.F.C.
 R.F.C.—Moody, 626 Ft. Sgt. R. J. (Odiham).
 WOUNDED.—R.F.C.—Prance, 2008 Sgt. J. E. (Bideford).

Reported March 30th.

WOUNDED AND PRISONER IN GERMAN HANDS.—Reeves, Sec. Lt. W. A., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Bronskill, Sec. Lt. F. H., R.F.C.

Reported March 31st.

KILLED.—Leggo, Lt. A. R., Canadian Cavalry, attd. R.F.C.
 DIED OF WOUNDS.—Lidsey, Sec. Lt. W. J., Oxford. and Bucks L.I. and R.F.C.

WOUNDED.—Jones, Capt. H. W. G., Welsh R. and R.F.C.
 Lowe, Capt. C. N., R.F.C.

Taylor, Sec. Lt. F. G., R.F.C.

White, Sec. Lt. C. M., R.F.C.

MISSING.—Baker, Lt. R. P., Canadian Infantry, attd. R.F.C.

Whiteside, Lt. H. S., Canadian Machine Gun Co., attd. R.F.C.

KILLED.—R.F.C.—Lamplugh, 3158 1st Cl. Air Mech. S. C. (Moseley).

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—R.F.C.

—Jeffs, 3023 Cpl. B. F. G. (Headington).

Haxton, 649 F. Sgt. E. (Dundee).

Reported April 2nd.

KILLED.—Brunwin-Hales, Capt. G. O., Essex R. and R.F.C.

Cooper, Sec. Lt. J. S., R.F.C.

Gibson, Sec. Lt. A. F., Leinster R., attd. R.F.C.

Gray, Sec. Lt. G. T., R.E., attd. R.F.C.

Hare, Sec. Lt. E. J., R.F.C.

Low, Sec. Lt. E. B., R.F.C.

McLeay, Sec. Lt. D. M., Argyll and Suth'd Highrs. and R.F.C.

Norton, Lt. H., R.F.C.

Tagent, Sec. Lt. H. W., R. Irish Fus., attd. R.F.C.

Tillett, Sec. Lt. R. A. W., Yeomanry and R.F.C.

Watt, Sec. Lt. G. M., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Cody, Sec. Lt. S. F., R.F.C.

Cotton, Sec. Lt. W. M. V., R.F.C.

Gibbon, Sec. Lt. J. T., R.F.C.

Lyle, Sec. Lt. J. V., R.F.C.

Maule, Lt. E. B., Highland L.I., attd. R.F.C.

Spicer, Sec. Lt. E. D., R.F.C.

DIED OF WOUNDS.—Gay, Sec. Lt. F. H., R.F.C.

WOUNDED.—Baerlein, Sec. Lt. A. A., R.F.A., attd. R.F.C.

Collins, Sec. Lt. A. D., R.F.C.

Dunn, Lt. H. F., Highland L.I. and R.F.C.

Galli, Sec. Lt. E. D. G., A.S.C., attd. R.F.C.

Haydock, Sec. Lt. G. H., Highland L.I., attd. R.F.C.

Littlejohn, Sec. Lt. R., R.F.C.

Peacock, Sec. Lt. S. C., London R. and R.F.C.

Sworder, Sec. Lt. D. K., R.F.C.

Wickham, Lt. N. W., R.F.C.

Whitley, Lt. C. A. F., M.C., R.F.C.

MISSING.—Anderson, Lt. W., M.C., R.F.C.

Allinson, Sec. Lt. F., R. W. Surrey R., attd. R.F.C.

Butler, Lt. H., Yorks R., attd. R.F.C.

Chuter, Lt. H. A., R. Fusiliers, attd. R.F.C.

Costello, Capt. W. H., R.G.A. and R.F.C.

Gilbert, Lt. C. G., R.F.C.

Henderson, Capt. E. J., R.F.C.

Lowery, Capt. A. M., R.F.C.

Middleton, Sec. Lt. J. R., R.F.C.

Norris, Sec. Lt. L. A., R.E., attd. R.F.C.

Phillips, Sec. Lt. N. A., R.F.C.

Swann, Lt. G. W., A.S.C., attd. R.F.C.

Ward-Price, Lt. L. S., Household Cavalry, attd. R.F.C.

Will, Lt. J. G., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND PRISONER OF WAR IN GERMAN HANDS.—Alder, Sec. Lt. S., Sherwood Foresters, attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS OF WAR IN GERMAN HANDS.—MacLennan, Lt. J. E., Cameronians, attd. R.F.C.

Whitney, Sec. Lt. R. T., R.F.C.

PREVIOUSLY MISSING, NOW REPORTED BY GERMAN GOVERNMENT

KILLED OR DIED OF WOUNDS.—R.F.C.—Evans, 25178 Sgt. R. S. (Herne Bay).

Reported April 3rd.

KILLED.—MacQueen, Sec. Lt. A. N., Gordon Highrs. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Butler, Lt. H., Yorks R., attd. R.F.C.

Henderson, Capt. E. J., R.F.C.

Norris, Sec. Lt. L. A., R.E., attd. R.F.C.

WOUNDED.—Robbins, Sec. Lt. R. F., Lincoln R. and R.F.C.

MISSING.—Vane-Tempest, Lt. C. S., Durham L.I. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Hunt, Lt. B. F. G., Yeomanry and R.F.C.

PERSONAL NOTICES.

DEATHS.

ALLEN.—Lt. Melville Richard Howell Agnew Allen, R.F.C., who was accidentally killed while flying on March 21st, was the only son of Mr. and Mrs. Richard William Agnew Allen, of Woodlands, Clapham, near Bedford, and was 25 years of age. He was educated at Harrow and Trinity College, Cambridge, and after leaving the University he entered the works of Messrs. W. H. Allen, Son and Co., of Bedford, as a pupil, passing through all the departments.

He joined the R.F.C. in Jan., 1915, and went to the front with his squadron early in Sept., 1915, returning home in Dec. of the same year for special duty in the construction of aircraft engines. For seven months he had the sole charge of testing engines.

He returned to the R.F.C. in Sept., 1916, and was appointed a flying officer to the Testing Squadron. He was an experienced pilot, and was much respected by his brother-officers, non-commissioned officers, and men. He married in Aug., 1915, Dorothy Drina, elder daughter of Major and Mrs. Lightfoot, of Anchoret, Bedford.

* * *

BAXTER.—Lt. Fred Oscar Baxter, M.C., Indian Army Reserve of Officers, attd. R.F.C. (killed in action), had his commission in the I.A.R.O. in Jan., 1915. His award of the Military Cross was in the Birthday Honours List last summer, and he was gazetted a flying officer, R.F.C., in the following October.

* * *

BOORNE.—At a Leicestershire town, on March 29th, an inquest was held on the body of Sec. Lt. Geo. Howard Boorne, R.F.C., who died the previous day as the result of an accident while flying over the Midlands on March 8th. A verdict of "Accidental Death" was returned. Mr. Boorne, who was 24 years of age, was a native of Ottawa.

* * *

BRUNWIN-HALES.—Capt. Greville Oxley Brunwin-Hales, R.F.C. and Essex Regt., killed while flying at the front, aged 27, was the eldest son of Canon and Mrs. Brunwin-Hales, of Colchester, and grandson of the late Rev. George Hales, of Norfolk and Yorkshire, and of the late John Oxley Parker, of Woodham Mortimer Place, Essex. He was educated, like his father, at Winchester and Jesus College, Cambridge, and when war broke out was land agent to Mr. Christopher Turnor, of Stoke Rochford, Lincolnshire, and also to the Dowager Lady Carnarvon. He was gazetted flt.-comdr. last December. His only brother, Sec. Lt. H. T. Brunwin-Hales, Lincoln Regt., fell in the battle of Loos in October, 1915.

* * *

CODY.—Sec. Lieut. S. F. Cody, whose death on active service was reported in the last casualty list published on April 2nd, was the youngest son of the late Samuel Franklin Cody. Those who were honoured with the friendship of his distinguished father and who had the privilege of his company during his experiments on Laffan's Plain, will remember Frank Cody as a long slip of a lad, more like his father in build and appearance than his elder brothers, and promising when he grew up to reproduce his father's Herculean frame. He was a cheery youngster, always mixed up in some adventure or other, as often as not bearing the marks of some recent smash with bicycle or motor, but, withal, far from being empty-headed or reckless. In fact, he showed quite plainly that Irish-American ancestry of the kind which has done so much to enliven the world. He had plenty of brains, and he worked energetically and earnestly on his father's aeroplanes whenever he was on holidays, and after school hours.

Like all his family, he was devoted to his father, and he naturally regarded the Cody aeroplane as the finest flying machine in the world, which it proved itself to be in its day on sheer performance in open competition against the world's best, and Frank's joy when it won the Military Competition in 1912 did one good to see.

At a very early age, before he was 21 I believe, he married a charming girl at Aldershot, and everything seemed to promise him a long and happy life. When war broke out he joined the R.F.C. as a mechanic, though better entitled to a commissioned rank than many who were given commissions direct from civil life. However, after some time in the ranks he won his commission on sheer merit, which after all is a just cause for pride. It is worthy of note that one of his brothers holds an important position in connection with aircraft work, and that the other is an R.F.C. officer, so that the Cody family is indeed doing its duty by its adopted country.

Later on Frank Cody became a very capable pilot, and his death deprives the R.F.C. of a young officer of considerable promise.

To his young widow, and to his own family, all will offer sincere sympathy in their great loss.—c. g. c.

* * *

ELPHINSTONE.—Major Montague Elphinstone, Army Service Corps, attd. Royal Flying Corps (died on his birthday of wounds received in action on the same day, March 22nd), was 37 years of

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age, and the youngest son of Mr. Henry Walker Elphinstone. He reached the rank of Major in the A.S.C. in June last year, and in the following Dec. was gazetted a flying officer in the R.F.C.

FOWLER.—Sec. Lt. David Dennys Fowler, R.F.C., killed in an accident on March 17th, at the age of 19, was the elder son of the late Mr. and Mrs. James Fowler, of Wimbledon and Rottingdean, and was born in South Australia.

He was educated at Harrow, and after a short time at Trinity College, Cambridge, joined the R.F.C., and spent some months on service in the North of England. In Sept., 1915, he was ordered to Salonika, and in Oct. was wounded in action and placed in hospital at Malta. In Dec. he was invalided home, and on recovery was posted to an aerodrome at home. Both his brother-officers and his men speak of him as a most fearless and competent aviator. He was buried with military honours in Rottingdean Churchyard on March 20th.

GRATTAN-BELLEW.—Major Willie Grattan-Bellew, M.C., Connaught Rangers and R.F.C. (died on March 24th from injuries received while flying on active service), was second son of Sir Henry and Lady Sophie Grattan-Bellew. He was 23 years of age, and had his commission in the Connaught Rangers in March, 1916.

His award of the Military Cross was gazetted last July "for conspicuous gallantry and skill on several occasions, notably the following: (1) With three other machines he attacked and drove off eight enemy machines, and forcing one to the ground. (2) He attacked four Fokkers, forcing one down to 2,500 ft. Another was seen to crash to the ground during the fight. (3) When on a bombing raid two of the machines got behind owing to the clouds, and were attacked by Fokkers. Capt. Grattan-Bellew returned and attacked three Fokkers, one of which his observer shot down and the others made off."

HUGILL.—Sec. Lieut. Valentine Francis Herbert Hugill, Royal Fusiliers, att'd. R.F.C. (reported missing on Oct. 16th, 1916, now reported killed in action), was son of Dr. G. F. Hugill, of Balham High Road. He was 22 years of age, and had his commission in June, 1915; his appointment as flying officer was gazetted last August. Previous to this he was acting as dispatch rider attached R.E.

LEASK.—An inquest was held at Aldershot on March 28th concerning the death of Lt. John Leask, R.F.C., who was caught in a blizzard while flying in a single-seater aeroplane. Witnesses stated that the wind swung the machine completely round, but the pilot regained control. The machine was swung round a second time, turned two somersaults, and nose-dived from a height of 500 ft. The pilot's neck was broken. A verdict of accidental death was returned.

LIDSEY.—The death is officially reported of Lt. W. J. Lidsey, R.F.C., the eldest son of Councillor William Lidsey, of Banbury. He was educated at Brackley School, and at the outbreak of war joined the Oxfordshire and Buckinghamshire Light Infantry. Mr. Lidsey was given his commission while serving in France. He afterwards transferred to the R.F.C. He was 21 years of age.

LONG and SELLERS.—On March 28th two flying officers were killed at Upavon, Wilts. The pilots were Lt. Alfred Pocock Long, Middlesex Regt., att'd. R.F.C., 29 years of age, and Sec.

Lt. Philip Sellers, Worcester Regt., att'd. R.F.C., 19 years of age, whose home is at Malvern. Mr. Long was flying up and down about a mile from the aerodrome, and Mr. Sellers was to mount above him and dive towards him as in an attack. In this operation one of the machines apparently struck the tail of the other machine. A verdict of accidental death was returned.

Mr. Sellers was the son of the late H. B. Sellers, formerly general manager of the Yorkshire Penny Bank. He was educated at Sandhurst, and was only gazetted flying officer a few weeks ago.

LOW.—Sec. Lieut. Eustace Bertram Low, R.F.C., who was accidentally killed on active service on March 24th, aged 18, was the third son of the Rev. A. E. and Mrs. Low, of St. John's Vicarage, Folkestone. He was educated at St. Christopher's, Eastbourne, and Haileybury. He received his commission and joined the R.F.C. from Haileybury in August, 1916, and went to the front last January.

MCLEAY.—Sec. Lt. Duncan Matheson McLeay, Argyll and Sutherland Highlanders and R.F.C., killed, was wounded at Festubert while serving in the ranks. He was 23 years of age, and received his commission last year in recognition of his soldierly qualities in the field. Mr. McLeay, who had been in the service of the North British Railway Co., was a son of Mr. and Mrs. McLeay, of Inverness.

MURRAY.—Lt. Antony Archibald Murray, Canadian Contingent and R.F.C., killed in action on March 19th, was the husband of Amy Murray, Netherside, Woodbridge, Suffolk, aged 36.

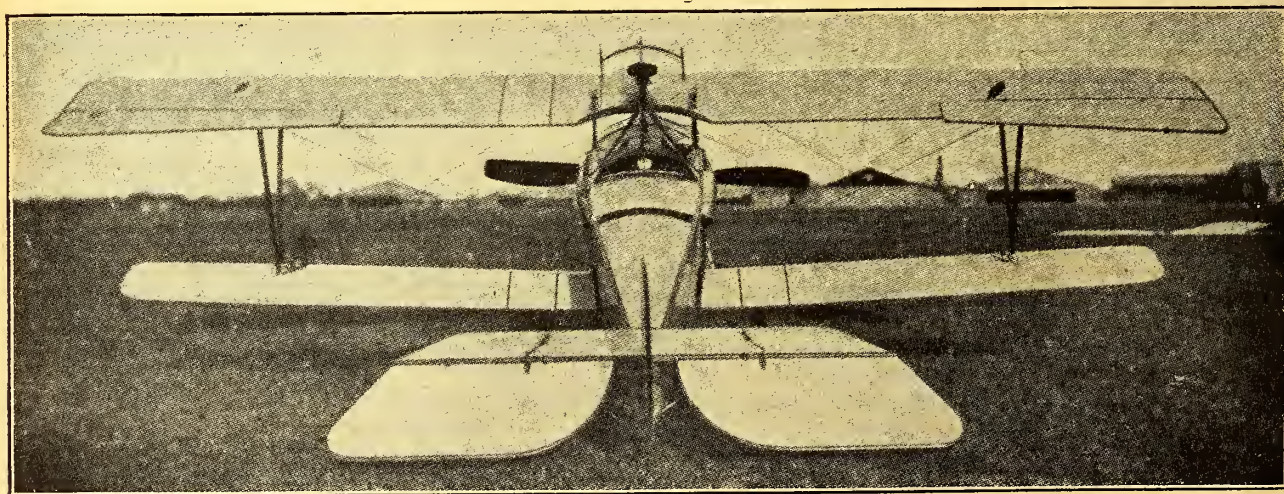
NORTON.—Lt. Hugh Norton, R.F.C., who was killed in action on March 24th, 1917, was the son of Mr. and Mrs. David Norton, of Engedi, Eastbourne. He was aged 24 years.

SPICER.—Sec. Lt. Edmund Daniell Spicer, R.F.C., previously reported missing, now stated to have been killed in action, was 18 years of age, and was the younger son of Mr. and Mrs. Newton Spicer. He took his pilot's certificate at Hendon in Aug., 1915, obtained his commission in the R.F.C. in April of the following year, and went on active service on July 4th.

His commanding officer writes: "He very soon became one of the most reliable pilots I have ever known. He was most extraordinarily persistent, and we always used to feel that if he was leading a reconnaissance it was sure to be successful. . . . He was always one who would seek danger rather than avoid it, and one cannot possibly blame a fellow who is braver and more dashing than he ought to be."

TAGENT.—Sec. Lt. Harold W. Tagent, R.F.C., who has been killed in action in France, was the only son of Mr. and Mrs. G. A. Tagent, of Compton Road, Winchmore Hill, N. He was aged 22. He enlisted in the Public Schools Batt'n., Royal Fusiliers, soon after the outbreak of war, and later obtained a commission in the Royal Irish Fusiliers. In 1916 he was transferred to the R.F.C., and was engaged in aerial photography at the time of his death.

WALLACE.—Lt. Edgar Wallace, R.F.C., a member of the Canadian Contingent, was flying in Berks on March 27th, when the machine nose-dived from a considerable height. Mr. Wallace was instantaneously killed, and at the inquest on March 28th a verdict of accidental death was returned.



Reproduced from "La Guerra," the Italian Official Publication.
A rear view of the Macchi-Nieuport biplane

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WATT.—Sec. Lt. George Macdonald Watt, R.F.C., killed, was the second son of Mr. George Watt, K.C., Sheriff of Inverness, Elgin, and Nairn, and was 27 years of age. He was educated at Fettes College, and after leaving played Rugby football for Edinburgh Institution. Mr. Watt went to Burma in 1912, but returned to join the Army, subsequently getting his commission.

ENGAGEMENTS.

CADMAN—JOHNSON.—The marriage arranged between Lt. Richard Cadman, R.F.C., youngest son of the late Mr. J. C. Cadman, M.I.C.E., M.I.M.E., and Mrs. Cadman, of Newcastle, Staffordshire, and Eileen Mary, eldest daughter of Mr. and Mrs. E. W. Johnson, of Llandudno, will take place quietly at Llandudno on April 25th.

* * *

DARWIN—ROSE.—The marriage arranged between Capt. J. W. Darwin, Coldstream Guards and R.F.C., and Miss Sibyl Rose, will take place on Wednesday, April 18th, at Holy Trinity, Brompton, at 2.30 p.m. All friends will be welcome at the church.

* * *

PICKTHORN—BELL.—The marriage arranged between Capt. C. F. M. Pickthorn, R.F.C., second son of the late Charles Wright Pickthorn and Mrs. Pickthorn, and Betty Dorothy, elder daughter of the late William Bell and Mrs. Batten-Bell, of 24, Alwyne Mansions, Wimbledon, will take place (leave permitting) at St. Mary's Church, Wimbledon, on Saturday, April 28th, at 2.30 p.m. No invitations will be issued, but friends will be very welcome at the church.

MARRIAGES.

BARLEY—GOODHAND.—On March 31st, at St. Saviour's Church, Croydon, by the Rev. G. H. Kempe, Horace Witcombe Barley, R.F.C., youngest son of Mrs. J. Barley, Finsbury Park, London, was married to Kathleen Mary Goodhand, youngest daughter of Mrs. F. Goodhand (late of Louth, Lincs), Croydon.

* * *

BUSH—BOURNE.—On March 29th, at St. Stephen's Church, Westbourne Park, by the Vicar, the Rev. Shepley Smith, Paul Francis Wheler Bush, Lieut., R.F.C., eldest son of Robert Evans Wheler Bush, of Oakfield, Rugby, and Mrs. Bush, of 21, Abbey Court, Abbey Road, was married to Kathleen, youngest daughter of the late Wykeham Bourne and Mrs. Bourne, of 53, Oxford Gardens, W.

* * *

FULLER—LEGG.—On March 21st, at Jesmond Parish Church, Newcastle-on-Tyne, by the Rev. G. D. Oakley, Vicar, Edward Newman, Lt.-Col. (temp.), R.F.C., youngest son of George Fuller, of Church Norton, Selsey, formerly of the Stock Exchange, and Mrs. Fuller, was married to Dorothy Kate, eldest daughter of Mr. and Mrs. James Legg, of Paul's Dean, Salisbury.

MARCHANT—HALL.—On Sunday, March 25th, at Folkestone, Leonard Varney Marchant, Reserve Cavalry and R.F.C., eldest son of Joseph Marchant, 11, Julian Road, Folkestone, was married to Daisy, only daughter of Alderman Fred Hall, J.P., The Rivulet, Folkestone.

It is reported that 100 Russian cadets arrived at Reading on March 29th for instruction in flying.

They were met at the station by the band of the Royal Berkshire Regt., which played the Russian National Anthem, and their appearance in the streets was greeted with cheers by a large crowd.

"London Opinion" for April 3rd makes the following interesting statement:—

The attitude of the Royal Flying Corps towards Lieut. Raper's candidature for Parliament for North-East Bethnal Green was demonstrated by the presence, at a recent concert given in his honour by the local Unionist Association, of many of his fellow-officers, and there was quite an imposing array of D.S.O. and M.C. ribbons. Lieut. Raper is anxious that his candidature should not be deemed to be connected with any new agitation for "air reform." He is, on the contrary, quite convinced that the Air Service is O.K., and is proud of his connection with the élite corps of the Army.

FRANCE.

OFFICIAL COMMUNIQUÉS.

MARCH 27th.—ARMY OF THE ORIENT.—There was great activity on the whole front. A German aeroplane was brought down near Prespa Lake. The pilot and observer were made prisoners.

MARCH 29th.—Yesterday a German aeroplane was brought down in an air fight by one of our pilots.

MARCH 31st.—Yesterday evening some German aeroplanes dropped bombs on the region of Dunkirk. Two persons of the civilian population were killed and three wounded.

APRIL 1st.—Notwithstanding the bad weather which has prevailed along the front, our pilots have during the course of the

week been engaged in numerous aerial battles, and have destroyed seven German machines.

The fighting has enabled Lt. Dorme to bring up to 18 the number of hostile aeroplanes which he has brought down. Capt. Doumer and Adjutant Casale have each brought down their seventh adversary, and Capt. Matton has scored his fifth victory.

APRIL 2nd.—A German aeroplane was brought down about 3.30 in the Rambervillers district (Vosges).

ARMY OF THE ORIENT.—To the rear of the front the enemy air service bombarded Ekshisu hospital.

This is the fifth time within a month that the enemy has attacked our medical units, although they are clearly indicated to aviators by very conspicuous red crosses.

Among the victims are 20 Bulgarian prisoners.

* * *

From Paris the death is announced of M. Spiess, inventor of the rigid airship of that name.

GERMANY.

OFFICIAL COMMUNIQUÉS.

MARCH 29th.—East of Verdun our aviators shot down two captive balloons. Four enemy aeroplanes were brought down in air battles and by anti-aircraft fire.

APRIL 1st.—Our aviators brought down two captive balloons in flames, and dropped bombs effectively upon troop camps in the Tchernia bend.

* * *

It is reported that on Lake Constance during the great storm of March 30th, two airship hangars at the Friedrichshafen factories were completely wrecked. Three mechanics were killed.

RUSSIA.

OFFICIAL COMMUNIQUÉS.

MARCH 22nd.—Enemy aeroplanes set fire to two of our captive balloons.

In the region of the little town of Svoltitchi (east of Baranovitchi) and north-west of Kimpolung, two enemy aeroplanes were hit by our fire and fell into our lines. The aviators were taken prisoners.

MARCH 28th.—Detachments of our seaplanes made a raid on Terkos, 27 miles north-west of Constantinople, and dropped 50 bombs on the aqueduct which supplies Constantinople with water.

The same day another detachment of our seaplanes made a raid on Tulucha (on the Danube) and dropped bombs there.

MARCH 30th.—ROUMANIAN FRONT.—In the region of Bourka (23-1.3 miles north of Focani) our artillery brought down a German aeroplane.

CAUCASIAN FRONT.—One of our aeroplanes bombarded Tulcea.

APRIL 1st.—ROUMANIAN FRONT.—An enemy airship was burnt as the result of attacks by our aeroplanes and gunfire in the region of Odobesti (north-west of Focani).

A squadron of our aeroplanes, consisting of 22 machines, made a raid on Braila. Bombs were dropped on the pier, the docks, and the stores, causing great fires. Harassed by our aeroplanes the boats left Braila and sailed up the Danube.

APRIL 2nd.—BLACK SEA.—On the coast of Anatolia one of our torpedo-boats completely destroyed by artillery fire two airsheds in the region of Kerasund (west of Trebizond).

ITALY.

OFFICIAL COMMUNIQUÉS.

MARCH 27th.—A squadron of our aeroplanes dropped bombs on the hutments in the Vallarsa Valley in the neighbourhood of Geroli with good results. All our machines returned safely.

MARCH 29th.—Hostile aircraft dropped bombs on Gorizia, but we suffered no casualties.

It has been ascertained that on several occasions the Austrian troops have used explosive rifle bullets, and it has also been proved by wounds inflicted on our aviators, which have been medically examined, that such explosive bullets are also used in the quick-firing guns mounted on enemy aeroplanes. It is no longer possible to keep count of the number of violations of international law committed by the Austrians.

* * *

For those who admire F.B.A.s the school for such at St. Anna on the Lac Majeur, as our French friends call it, will make a great call. It is run by the S.I.A.I., not to be confounded with other firms of the same initials otherwise placed—(the F.I.A.T.'s aviation offspring is called the Società Italiana Aviazione, a business with 5 millions of lire of capital)—or the machines themselves known as "Savoias," both matters for future reference.

It was from here that the recent Guenzi record was made; so there is nothing much wrong with craft or pilots there.

* * *

The S.P.A.D. machines with Hispana S engines (see my notes in THE AEROPLANE for Jan. 24th, and the article on page 340 of the Jan. 31st number) are said to be very sporting to fly, and very game for aerobatics. I refer to the single-seater, which was the only type of which the pilot who told me about them had any experience.

The Gnomerhone Co. at Turin has added the Clerget to the list of motors it deals with.

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Of scientific progress, the only thing mentionable just now is a series of tests with an air-screw working in a tube-barrel on the enclosed fan principle. Not that there is anything new about this, of course, but there might well be, it seems, judging by the traction exerted by an early model.

The Austrian Kaiser's orders (or reported orders) to his men to "leave all ancient monuments alone in the future," is now said to have been modified by the words "when necessary."

According to a "pinkun," the rebel town of Aziziah, in Tripolitania, has been badly damaged by a Caproni on a punitive mission to release a pair of pilots, there confined as the result of a "panne" when over the enemy's lines.

I read a great deal in the earlier war literature of this land about a German "Rapp" motor. Was it known by any sweeter name in English circles? As "Rap" or "Knock" I no it knot.

Captains Savoia and Verduzio have obtained their Majority. Both of them are at the top of the tree as technical advisers; the latter was a lighter-than-air man in very early times, and probably has not forgotten much since then.

Speaking of a commercial "rapprochement" between this country and Russia, a Como paper, commonly supposed to be inspired by an "ex-Minister," says, after reporting overtures from Russian sources, that "a group of Italian bankers, under the presidency of the Bank of Italy, has advanced a loan to Russia of 250,000,000 of lire. This loan is guaranteed by paying Russian orders placed in Italy for aircraft material, camp telephones," etc.

The French Parliamentary Mission, which has been paying a round of visits to the more important Italian cities lately, assisted at a particularly fine display of flying at Taliedo.

After being shown round by Lt.-Col. Moda, and other officers, the Mission enjoyed a spectacle rarely seen off the battlefields. Numbers of the well-known Nieuports, Savoias, and Aviatiks were in the air, and looping of many loops was performed.

The big Capronis showed up very well in this, Lt. Resnati accomplishing the manœuvre many times in very distinguishable fashion. One of them, a big triplane, which had come over from Malpensa, left later on in the proceedings. The weather was very suitable for the finest airmanship display.

The Postmaster-General is in close co-operation with the leading naval and engineering experts as to the possibility of running a postal service by air. Presumably the postal air-lines will follow the canals and natural watercourses of this land of big rivers and lakes, if only for economical reasons. Landing places every 10 miles in a highly-cultivated land would be a big item.

The undoing of those two raiding "Löhnern" at Udine, referred to in the official report of Feb. 12th, was a most sporting affair and spectacular in the extreme. One of the hostile craft wisely turned back, the other, a most beautiful machine in both the technical and artistic senses of the word, arrived over the heart of Udine, to take photos it would appear, during the Church parade. Nothing of the sort had happened for so many months that the people could hardly believe their eyes and ears. The Austrian put up, it is unanimously stated, a wonderful fight, showing great skill against hopeless odds.

The machine was finally brought down in very fair condition and without loss of life. Large sums for the War Charities were realised by its exhibition in the following days. Capt. Baracca distinguished himself in the little affair, and as he had already brought down five other enemy planes he was awarded the silver "For Valour" medal. Prince Rufto and Sergeants Poli and Garini—the latter a recordman in civilised flying—were decorated on the same occasion.

Signor Feroldi pointed out to me the other day that his instrument is the only fixed-level carburettor which has been a success on rotaries. Though aiming at these it has been fitted to most of the better-known fixed aero motors, to Anzani's up to 100 h.p., to F.I.A.T.s. 100 to 200, and to F.I.s. and Renaults. Risk of fire in the case of rotaries is the obvious advantage to add to the Feroldi's proven economy. Two hundred of the lorry type have just been ordered for a well-tried tractor vehicle, to replace present carburettors thereon fitted.

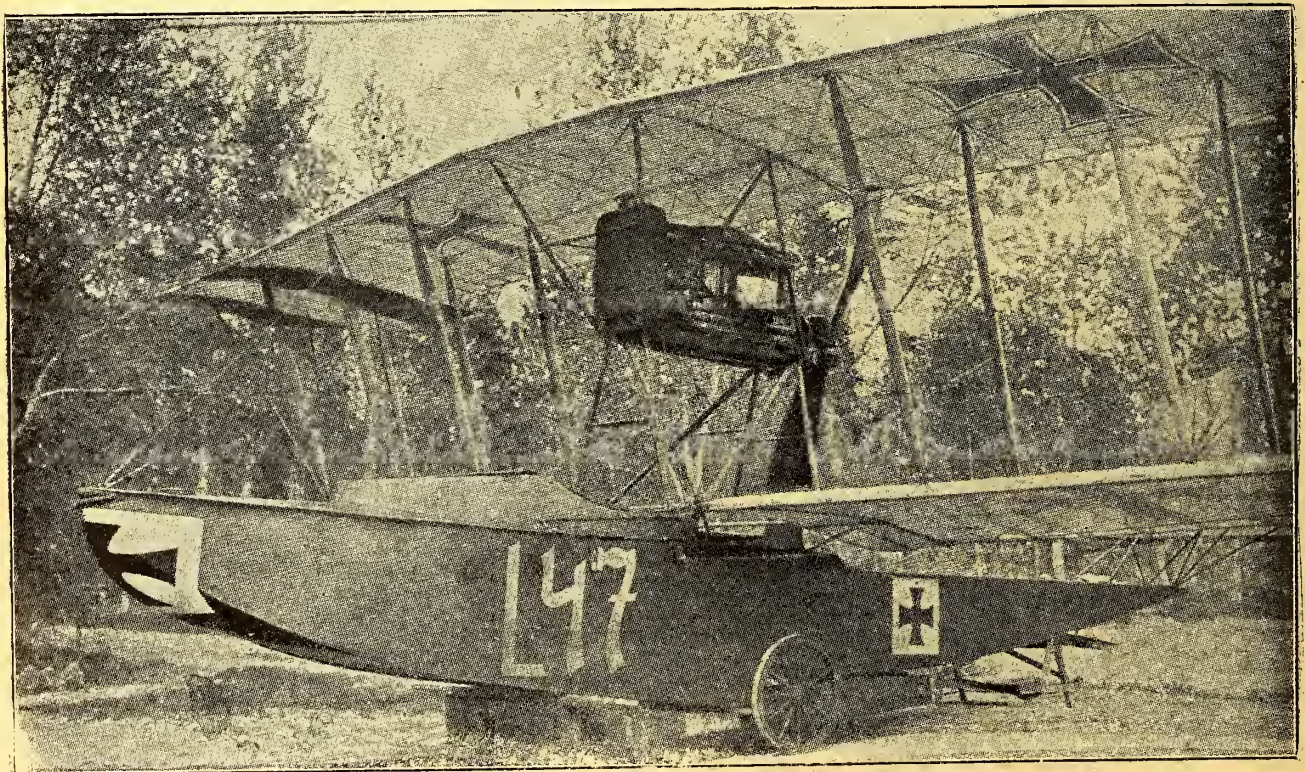
A large single-seater German-built seaplane with a 6-cylinder vertical 200-h.p. engine has been found drifting near Senigallia on the Adriatic coast and salvaged by a section of the Armoured Train Corps. The machine bears a (Service?) identification mark N.15 B.M., and the builder's name, address and a works number (?), viz., Maximall Apparat-Fabrick, Berlin, S.V., 61, Paul Wilhelm.—2717.

The usual signs of the derelict having been in a scrap of importance were evident, and the ammunition for the gun had been used up. The propeller had given up the ghost and a "sweater" and pair of breeches alone spoke of the absent Director of Works, who seems to have made a swim for it. A "bank" ometer graced the watch-maker's shop as now used. Motor and fuel-tanks, holding 32 gallons, were to the eye undamaged. A spare propeller might have saved these from falling into Italian hands.—T. S. H.

TURKEY.

MARCH 30th.—Two aeroplane ships and three seaplanes appeared in the Black Sea at a distance of 25 miles from Derkos, in the afternoon of March 26th.

Our own aeroplanes and seaplanes went up to engage the enemy, and dropped bombs on an aeroplane ship, on which a hit was observed.



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Aerial fighting then took place, in which the enemy machines were compelled by machine-gun fire to withdraw with the aeroplane ships.

MARCH 30th.—SINAI FRONT.—Our aviators report that numerous British transport columns are retreating towards the south-west.

BELGIUM.

The "Nieuwe Rotterdamsche Courant" reports from Oostburg that on March 28th between 10 and 11 p.m. an air squadron dropped bombs on or near Bruges. The squadron was heavily fired at.

* * *

It was reported from Amsterdam that fire broke out on March 27th in a German military aerodrome at Berchem, near Brussels. Two Zeppelin sheds were destroyed. Both were empty at the time. A number of sheds, with aeroplanes under repair, were burned. The fire is said to have been started by three German soldiers of the German garrison at Brussels. They disappeared, probably deserting to Holland.

* * *

The Belgian newspaper, "La Metropole," now published in London, states that on March 18th King Albert, who was visiting a new military flying ground of the Belgian Army, expressed a desire to act as passenger in an aerial reconnaissance. His Majesty was piloted by the Belgian aviator, Capt. Jacquet, who has already accounted for several German machines. Preceded by a squadron of fighting planes, the King flew over the whole length of the Belgian Yser front at heights varying between 3,000 ft. and 6,000 ft., successfully taking several photographs. The German anti-aircraft guns put up the usual well-sustained fire, but no enemy aviator interfered.

SWEDEN.

It is reported that Capt. Sundstedt, a Swedish aviator, who has served with the French Army, has gone to the United States to make preparations for a flight across the Atlantic next month.

INDIA.

A reader on the North-West Frontier sends the following extract from a copy of his regimental journal:—

"Another welcome fall of rain occurred on Sunday, Jan. 21st, making the camp once more comparatively dustless. We had another 'flying' visit from the R.F.C. on the 18th. The tent roofs escaped damage by a narrow margin and, after scattering some hand bills advertising the Garrison Theatre, Nowshera, the pilot skimmed away to give a similar performance over the — and — lines."

[Wonderful how little difference climate makes to the tricks of the gay pilot.—Ed.]

AUSTRALIA.

It was reported from Melbourne on March 28th that the death occurred on that day of Basil Watson, a young Victorian aviator. After a magnificent flight over Melbourne, in the course of which he looped the loop over Laverton at a height of 2,000 ft., the

machine seemed to crumple and fall into the bay, where the aviator was found lying in three feet of water beneath the wreckage.

U. S. A.

The purchase of 16 non-rigid dirigible airships for coast and harbour patrol work at a total cost of £109,850 is announced by the United States Navy Department. The airships are the first of such a type to be bought by the United States Navy under the recent appropriation for aeronautics.

* * *

Mr. J. W. T. Mason, the "Daily Express" correspondent in New York, wiring on March 22nd, says that Albert Sanders and his assistant, Carl Wunnenberg, were sentenced on that day to two years' imprisonment and to pay a fine of £500 each for conspiring to send spies to England. District Attorney Knox, addressing the court, said the defendants had conspired with agents to go to England in the guise of newspaper men and report by means of invisible ink the location of anti-aircraft defences and other military secrets.

He added:—"This is simply another link in the vast and mighty chain of wilful violations of American laws to serve the German Empire. These men have never served their empire better than by pleading guilty and shielding those whom we desired to question."

COMPARATIVE FIGURES.

The following particulars are taken from the "Times":—

Only once since the beginning of the Battle of the Somme have the monthly losses of aeroplanes on the Western front exceeded those which were officially recorded in March. That was in September, when the figure for the French, the Germans, and ourselves was 322. Last month the losses numbered 262, made up as follows:—British (acknowledged by General Headquarters in France), 58; French (on the assumption that the German reports are trustworthy), 71; German (based on the British and French daily communiqués), 133.

British aviators accounted for 84 German machines, and these were officially classified as follows:—Destroyed, 14; driven down, damaged, 34, and out of control, 11; brought down, 22; fell in our lines, 3. Of the 58 British machines, eight were brought down in air fights or by anti-aircraft guns, and 50 were returned as "missing." The 84 to 58 compared with 41 to 23 in February, 41 to 15 in January, 35 to 10 in December, and 57 to 32 in November. In September of 1916 the proportion was at least 100 to 48, and of the 100, 53 were specifically reported as having been destroyed.

The French secured 49 German aeroplanes, which were reported in the following categories:—Destroyed, 10; fell in French lines, 4; brought down in air fights, 27; by anti-aircraft fire, 7; captured, 1.

German Main Headquarters, for the first time, acknowledged losses in its daily reports. But the admissions were obviously only intended to magnify their successes, and cannot be taken seriously. Here they are—with the other side of the shield as presented by the British and French reports:—March 4th.—



Reproduced from "La Guerra," the Italian Official Publication.
Nacelle and chassis of S.I.T.-Voisin. The brake drum may be seen at the inside of the rear wheel. The type of air-speed indicator is also interesting.



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—36—

German claim, 18, admitted loss, 4; British and French claim, 17 German machines. March 6th.—German claim, 15, admitted loss, 1; British and French claim, at least 7. March 16th-17th.—German claim, 22, admitted loss, 3; British and French claim, 30.

AN ECHO FROM THE PAST.

It was reported from Paris that, on March 28th, at the Seine Assize Court, the trial began of M. and Mme. Deperdussin, who are charged with swindling on a sensational scale. The evidence of the first witnesses showed that M. Deperdussin owed at the moment of his arrest £1,040,000.

M. Deperdussin, the famous aeroplane builder, and his wife are charged with forgery and defrauding the Comptoir Industriel et Colonial of £1,120,000.

Judgment was delivered on March 30th. M. Deperdussin was sentenced to five years' imprisonment, the serving of the sentence to be suspended.

After reading the judgment, the Presiding Judge said that M. Deperdussin owed the leniency of the Court to the work done by him in the defence of the country and to the flying heroes "who had come to cover him with their wings." The jury and the Court hoped that M. Deperdussin would use his liberty to do more good work for the country.

THE INVASIONS OF ENGLAND.

Charged before the magistrates on March 31st with being in possession of certain parts of a Zeppelin that fell near his cottage on Sept. 24th, 1916, an Essex ploughman said the portions of girders and window-frames were given him by men who cleared the Zeppelin away. He found the Zeppelin speedometer in a field four months after the airship fell. The case was dismissed, the Bench considering that defendant had no guilty knowledge. Defendant's request that he might retain the aluminium fragments in memory of the German aviators who called at his cottage was not granted.

INDIFFERENT WORKMEN.

Two young men were recently fined 10s. each for losing time. It was stated that they were engaged on very urgent aeroplane work, and, although they only started six weeks ago, they had lost considerable time. A representative of the firm said it was a very serious thing.

One hopes that this may be a lesson to all aircraft workers, and that less lenient penalties will be imposed in future cases.

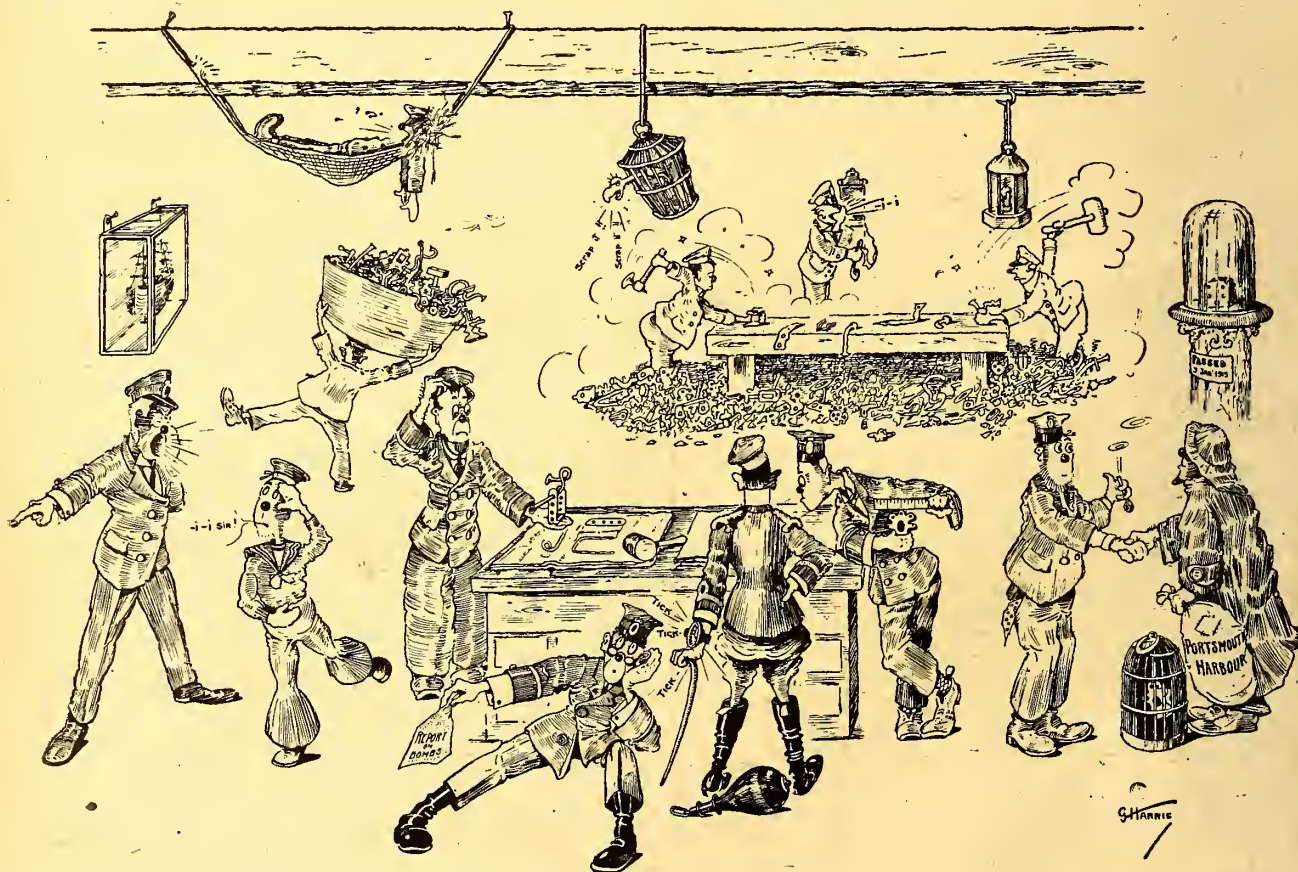
THE PASSING OF THE "BLUE BIRD."

It is reported in the general Press that a row of hangars and a canteen in the Brooklands aerodrome were destroyed by fire in the early morning of March 28th, the outbreak having, it is supposed, originated in the canteen. All the aeroplanes are believed to have been saved. The local fire brigade prevented the fire from reaching the large workshops and offices.

When one remembers how one smoked, and ran brazing lamps and even engines, and used plain oil lamps in the old sheds at Brooklands, regardless of open cans of petrol, and even pans full of petrol for the washing of parts, it seems a miracle that the whole place was not burned out years ago. And now the poor old "Blue Bird" disappears in flames under a strictly regulated military control. So passes the scene of what were the happiest days in the lives of many of the old hands in aviation.—C. G. G.

PRESENTATION AEROPLANES.

The Secretary of State for the Colonies announces that an additional sum of £4,500 has been collected in the Malay Peninsula through the agency of Mr. C. Alma Baker, of Kinta, Perak, for the purchase of two aeroplanes for the use of the Royal Flying Corps, which will be named "Malaya No. 31, The Kuala Kangsar," and "Malaya No. 32, The A. N. Kenion."



SCENES IN AN AIRCRAFT FACTORY.—XII.—INSPECTION (AIR DEPARTMENT).—In the immediate foreground a bomb-expert is deeply concerned regarding the intentions of a bomb carelessly left on the ground, and is apparently misled by the ticking of the watch of the active-service pilot behind him, whose combination of ultra-military uniform with Naval rank-stripes stamps him as having been employed on land-going aeroplanes abroad. He, in turn, is interested in the efforts of two examiners to reconcile certain fittings with the drawings, the gentleman on the left being particularly puzzled as to how a fair-lead should pass through a bolt-hole.

On the right, a warrant-officer inspector greets respectfully (as shown by his removing his pipe) a deep-sea pilot who has apparently just returned from Portsmouth with his pet spare part in a cage. Behind them, enshrined in glass, is the first fitting successfully got past inspection by the firm, and inscribed "3 Jan., 1915." Judging by the destruction of "dnd" fittings in the background, it appears to have been about the last also, for the department's pet parrot has picked up the cry of "Scrap it!"

Level with the parrot, the "watch below" is taking a well-earned rest. Below him, a viewer with a correct nautical roll is taking more fittings for inspection. The proper nautical atmosphere is preserved by the glass-cased model of a ship on the left wall, and by the use of the Naval method of whispering orders, and of receiving them, as illustrated by the officer and man on the left. The telephonist in the extreme background also replies "I—I—Sir," in Navy fashion. These customs prevent degeneration into mere lands-men by personnel employed on production work ashore.

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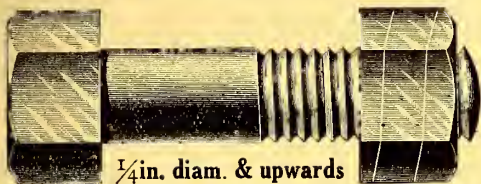
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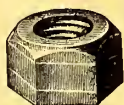
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ANSWERS TO CORRESPONDENTS.

On account of the labour involved in replying to questions from correspondents, many of which in the past have been answered over and over again by post, it has been decided to answer inquiries of general interest in the columns of THE AEROPLANE. Inquiries should be addressed to The Editor, 166, Piccadilly, W.

READERS BY THE HUNDRED.—If you want any information about joining the R.F.C., write to the Director of Military Aeronautics, Adastral House, Blackfriars, E.C.

If you want any information about joining the R.N.A.S., write to the Air Department, The Admiralty, Whitehall, S.W.

Men in the Army, and ratings in the Navy can only obtain commissions in their own branches or transfers to other branches by permission of their immediate commanding officers, who must forward those applications through the proper official channels.

Civilian applicants for commissions in the R.F.C. enter through the Cadet Wings, and are trained to fly at the Government's expense.

Applicants for commissions in the R.N.A.S. enter as Probationary Flight Officers, and are trained at Government expense.

If you are blind or partially blind, or have to wear glasses for any serious reason, you cannot become a Naval or Military aviator.

If you have had special technical training, are over 35 years of age, and attain the necessary social standard, which is not high, you may with luck become a Stores Officer R.N.A.S., or an Equipment Officer R.F.C., even if your sight is defective and you are physically deficient in other respects.

Information concerning appointments as viewers or examiners or inspectors in the Aeronautical Inspections Department may be obtained from the Chief Inspector, A.I.D., Adastral House, Blackfriars, E.C.

Observation of the points indicated above will save a great deal of unnecessary correspondence at the Admiralty, at Adastral House, and at this office, as there is no need to write letters on any point already explained above. The Editor is always pleased to answer questions or explain any points not understood by readers, but space in THE AEROPLANE is valuable, and the same question cannot be answered over and over again week after week. Consequently readers are requested to make quite sure that their questions have not been answered a week or so before:

M. G. S. (Hendon).—A Zeppelin costs somewhere round about £150,000 to £200,000 to build and takes about three months to construct. Assuming that its engines were working at full bore for a period of ten hours the petrol consumption would be roughly 1,000 gallons.

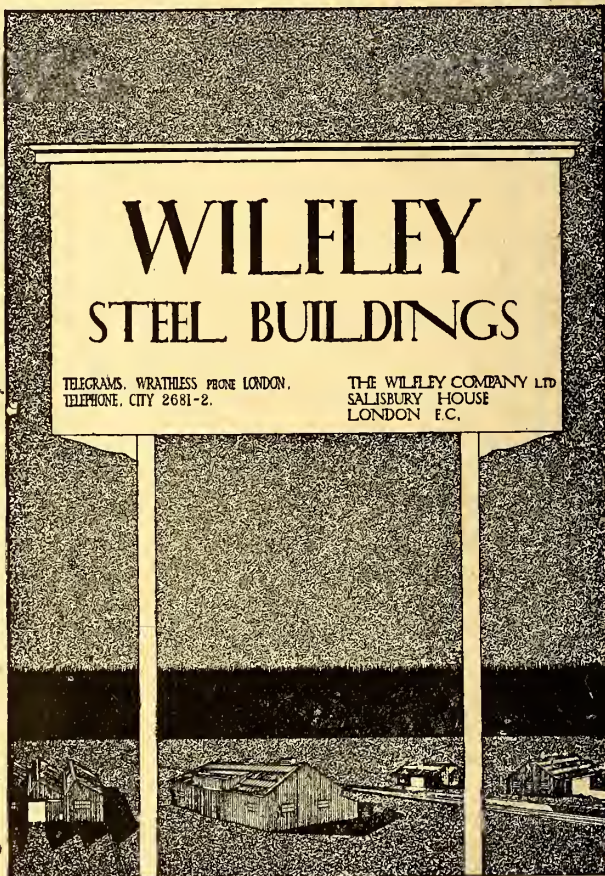
H. W. (Hove).—See paragraph 1 in the current issue. The rate of pay of boy learners in the R.F.C. is 1s. a day.

H. V. L. (Leeds).—See the first paragraph in "Answers to Correspondents." Questions such as you ask need official ruling, so you must write to the department concerned.

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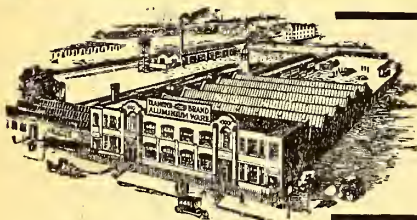
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G. H. E. C. (Buntingford).—If your application for a commission in the R.N.A.S. has been acknowledged, you are at any rate sure that it is receiving consideration, and that it has not been lost in the post. If you do not receive a notice in the course of the month to appear before the Selection Committee, probably your best plan would be to write and ask whether your application has been turned down or not. The period officially regarded as "shortly" means anything between a week and a year.

S. A. H. (Totton, Hants).—An excellent and elaborately produced book on the construction and care of the Gnome engine has just been published by the Gnome and Le Rhône Engine Company at the absurdly low price of 2s. 6d. This book is, however, probably intended for Service use only, and enquiries as to the possibility of obtaining it should be addressed to the Gnome and Le Rhône Engine Company, at 47, Victoria Street, S.W.

G. H. A. W. (South Farnboro', Hants).—Strictly speaking, anybody wishing to join the Aeronautical Society has to be proposed and seconded by members, but anyone employed in the Aircraft Industry, and able to present satisfactory credentials, could no doubt be accommodated with a Proposer and Seconder on making application to the Secretary of the Society, Mr. W. Barnard Faraday, at 7, Albemarle Street, W.1.

A.R. (Norbury).—Where two engines of similar type are used on twin engine aeroplanes, the propellers are made to run in opposite directions by arranging the cam-gears to suit, so that the engines themselves operate in reverse directions. In many such machines, however, both propellers revolve in the same direction without notable ill-effect.

In most aeroplanes of ordinary construction with big engines, the wings are trued up differently on opposite sides so as to counteract the tendency of the propeller to twist the aeroplane round itself, and also because on one side the slip stream of the propeller is thrown up against the planes and on the other side beats down on them. Consequently a slight difference in angle is needed. You will find reference to this in the notes on truing up of German aeroplanes, which appeared in "Aeronautical Engineering" recently.

H. M. (Loughton). Do please read the first paragraph to these notes. You can get all information on this subject from the Department of Military Aeronautics.

R. F. W. (Marlborough).—Nobody in this country knows what is going to happen to aviation after the war, as that depends entirely upon the particular clique which happens to be in charge of the country. It is, therefore, quite impossible to inform you whether, if you obtain a commission in the R.F.C. now, it will be possible for you afterwards to obtain a position in a Military aircraft factory.

If the Peace-at-any-Price Party are in charge, there would obviously be no military factories to go to, and if the Aircraft Industry lives up to its reputation, there will be no need for military factories at all, except, perhaps, some small experimental ones. And, of course, the amount of the pay you would start at, if you did obtain such a post in such a factory, would depend entirely upon the number of applicants for the job, and would be in direct inverse ratio thereto.

K.C.C. (Edinburgh).—It is possible for a boy under military age to learn to fly at two or three civilian flying schools, and the only school operating with civilians is the Bourriemouth School at Bournemouth. A nominal fee is payable for the Royal Aero Club certificate, which is not given to pupils under 17 years of age.

In the old times of peace anyone was allowed to keep an aeroplane without tax, and permitted to fly anywhere except over thickly populated towns and certain prohibited military areas.

It is impossible to say what the regulations will be after the war is over, but there is every likelihood that the requirements for the certificate will be more difficult, and it is more than a possibility that aeroplanes will be taxed to bring them into line with other motor vehicles.

D.D. (Ilfracombe).—It is difficult to advise you as to which of the Air Services offers the greater possibilities. As regards rates of pay there is not much to choose, except in a few instances where the comparative remunerations are somewhat anomalous.

At the present time there is probably more room for pilots in the R.F.C., but by the time you attain the qualifying age of 18 conditions in this respect may have changed.

Your best course is to decide whether you personally prefer to be in the Navy or the Army.

F. G. T. (Egypt).—There is no up-to-date book on the subject of gliding either with relation to design or construction. Some years ago Mr. T. W. K. Clarke, of T. W. K. Clarke and Co., of Hampton Wick, Middlesex, wrote a book on the subject. It might be worth your while to apply to him to see if he has a copy left.

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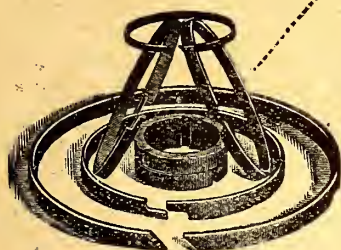
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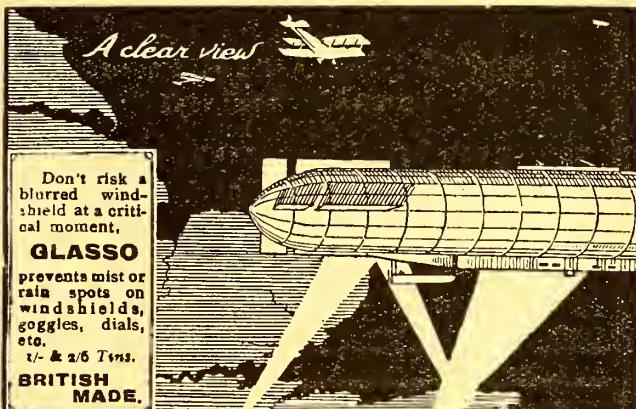
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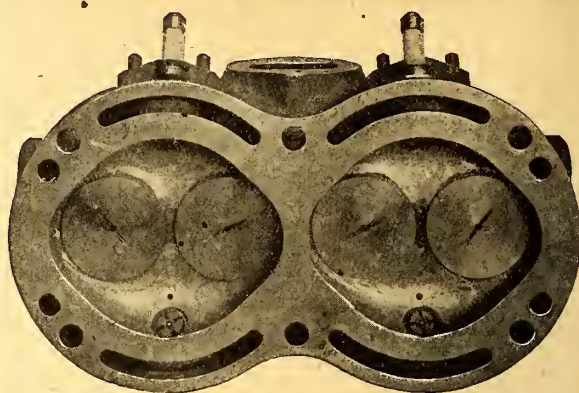
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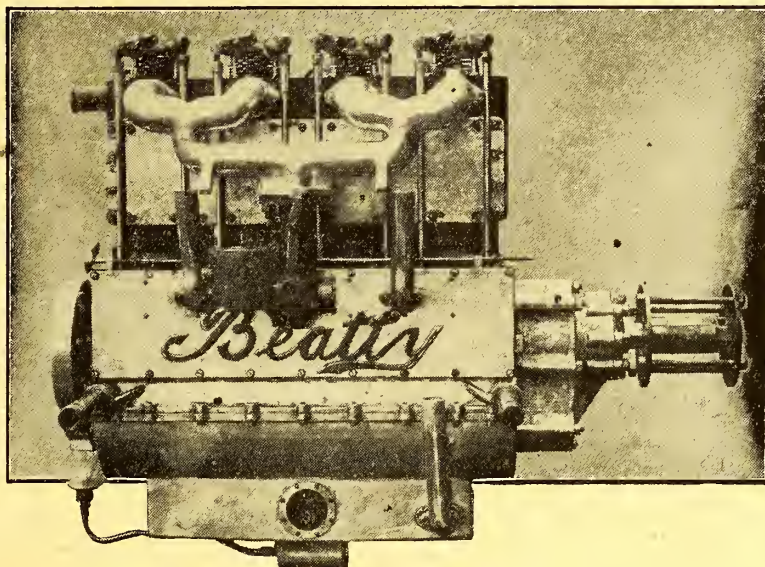
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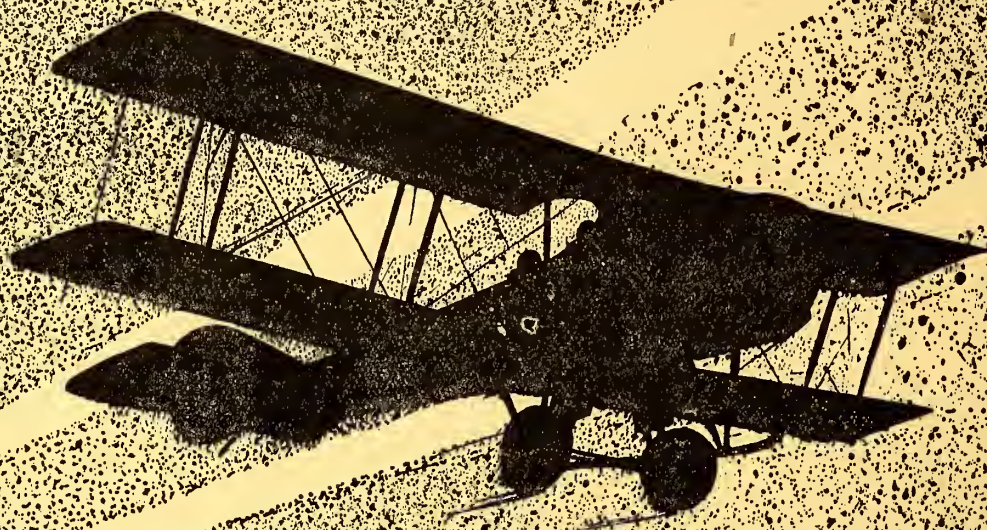
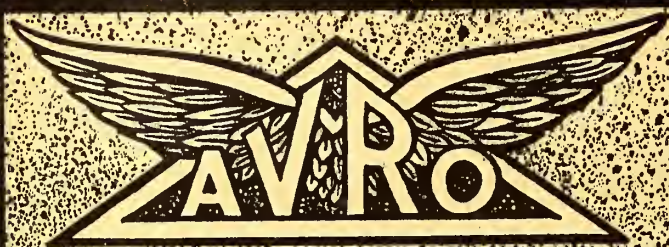
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ON OUR PRESENT HELP.

America's entry into the war will come as a very present help in time of trouble to the Allied Forces, and on behalf of all concerned with British aeronautics one ventures to extend a hearty welcome to our trans-Atlantic relatives as companions in arms. American aviators on active service in both the French and British Flying Services have done splendid work, and in this country American instructors have trained some of our best pilots, besides carrying out tests which have been of direct naval and military value. We, therefore, know something already of what we may expect from any reinforcements the aerial forces of the Allies may receive from America.

A HIGH STANDARD.

New American aviators will have to live up to a high standard of skill and gallantry set by their fellow-countrymen who have already taken part in the war on land and in the air, but there is no lack of material in the States from which to draw such men. The descendants of the men who followed Stewart and Sheridan in their great cavalry raids are eminently suited to carry aerial raids to an effective conclusion. And the nation which could produce the heroes who died with Dickson in the "King David's" attack on the "Housatonic," the first submarine attack in the world, is capable of producing again men who will make equally brave efforts in aerial attacks on enemy warships.

THE WORLD'S GREATEST WAR.

People are apt to forget that the greatest war the world has seen before this war was the American Civil War, and that one important reason for the success of the British arms to-day is that the brains of the British Army have for years studied the lessons of that war, whereas the German Staff has paid more attention to the wars of Napoleon and of the period of von Moltke. Our Staff has learned from America how to improvise an Army much as our manufacturers have learned how to improvise output: extravagantly, wastefully even, but, in the end, effectively. We can, therefore, thank the United States for many services already rendered in this war, and we can safely admit that the help yet

to come from America makes certain a more satisfactory issue to the present combat than could have been prophesied had that nation decided to remain strictly neutral, even on the principle of the American who said, "We are so darned neutral that we don't care which country whacks Germany."

A SUGGESTION IN BRIEF.

On the other hand, America has much to learn from the belligerent nations if she is to employ her great resources to the best advantage. As concerns aviation, America can teach and has taught us much in the matter of increasing output, but we can teach her a great deal about building aeroplanes and engines suitable for use in war. One ventures to suggest, therefore, that some of our leading British aeroplane firms would do well to form a working alliance with American firms of good standing, to their mutual advantage.

Exigencies of the press, caused by the short-handed staff of the printers of this paper taking a long overdue and well-earned rest at Easter, make it impossible to deal with America's part in the aerial war at length in this issue, but one hopes to do so much more extensively very soon, when it may be possible to give in detail some idea of what America did before the war and to deduce therefrom future possibilities. Also it may be possible to suggest some matters which America may well avoid.

THE U.S. NAVY.

At sea also there will be great opportunities for American aviators, and on the Naval side of aviation the U.S. Government has had the very finest available information throughout the war, so that American Naval aviators may well be in action even before the pilots of the U.S. Regular Army. One confidently expects valuable work from the Naval arm, which is better placed in every way at the moment than is American Army aviation. In any event, one wishes our latest Allies welcome, and every good fortune, and full opportunity for individual distinction.

C. G. G.

ON EFFECT AND CAUSE.

Without doubt the casualty figures published on Easter Sunday, April 8th, concerning the aerial battles fought in France on the previous day, will cause much discussion and mutual recrimination between the critics and the supporters of the administration of the Royal Flying Corps. It seems well, therefore, to discuss these figures and their meaning as dispassionately as may be.

Taking the various official communiqués of April 7th in turn, we find the numbers set forth thus:—

BRITISH.—Admitted that 28 machines are missing, "a large number of which are known to have been shot down over the enemy's country." Claimed that 15 hostile machines were "actually seen to crash, while 31 others were driven down damaged, a very large proportion of which must have been totally destroyed."

GERMAN.—Claimed that "the enemy (French and British) lost 44 aeroplanes, 33 in aerial engagements, 8 by anti-aircraft fire, and 3 by forced landings behind our lines." Admitted that "5 of our aviators have not returned."

FRENCH.—No reference is made of air fighting or aeroplane losses.

It may be taken for purposes of discussion that the published figures on both sides are accurate, for in no way do they contradict one another, and in any case they are only likely to be inaccurate to a small extent, owing to optimism on the part of fighting pilots exaggerating in one direction, or to belated returns from certain squadrons diminishing results in the other.

In either communiqué the admitted losses only include machines which failed to return. The British communiqué makes no admission of losses in territory occupied by our troops, nor of machines smashed in landing on return, owing to damage inflicted in air fights on the machines themselves or on the pilots, nor of accidents in landing.

Precisely similar remarks apply to the German admissions. The wide difference between the British admission of 28 lost and the German admission of 5 only is explained by the fact that by far the greater part of the fighting took place over territory occupied by the Germans, and therefore nearly all the German machines which were brought down fell into their own hands, and so in fact and theory "returned."

IS THE OFFENSIVE A DISADVANTAGE?

It may thus be seen that the figures of admitted losses are of little value as an indication of actual results, beyond indicating on which side of the infantry fighting line the bulk of the aerial fighting took place.

It has yet to be stated officially that attacking aeroplanes are at any disadvantage as compared with those attacked. To the student of war it would appear that a fast flying and climbing aeroplane attacking a slower one has a distinct advantage over it, but possibly this view may be wrong in official and better-informed eyes—if so, an explanation of the phenomenon would be interesting. On the other hand, it would appear impossible for a slow aeroplane to attack a faster one. In any case, attacking aeroplanes would not seem to be confronted with as great disadvantages as are infantry in the open attacking entrenchments defended by wire and machine-guns. Therefore the fact of attacking would not in itself seem to account for a heavy proportion of losses, unless the attacking machines were brought down by gun-fire from the ground.

A SIGNIFICANT STATEMENT.

If, however, one takes into consideration Sir Douglas Haig's statement that "a large number" of our machines "are known to have been shot down over the enemy's country," and if one couples it with the curious

German admission, though it is put forward as a claim, that only 8 of the Allies' machines were brought down by anti-aircraft guns, and only 3 by engine failure, one is forced to the conclusion that our losses in air fights were proportionately heavier than might have been expected.

Assuming, as appears probably to have been the case, that the majority of our lost 28 were bomb-dropping machines, one would have expected them to have been brought down by gun-fire from the ground when descending low to make certain of their aim at important railway junctions or munition dumps, which would naturally be well defended by anti-aircraft guns.

If it be true, as stated by the Germans, and as one infers from the phrase "shot down," that by far the greater number of our machines were the victims of the German fighting machines, the logical conclusion is either that our own fighting machines were inferior in numbers to the Germans', or inferior in quality.

If, on the other hand, our losses include a large proportion of fighting machines, as distinct from bomb-droppers, the same conclusion is even more obvious.

TO AVOID MISAPPREHENSION.

Let there be no misapprehension on one point. It must not be thought for a moment that the British losses, even if one adds crashes in our own territory to the 28 which failed to return, are disturbingly high, considered purely as figures.

On both sides certain infantry battalions have been completely wiped out and reconstructed several times over in the course of the war. It would be merely the adverse fortune of war if the whole Flying Corps were wiped out in one action, as has happened to infantry battalions and even brigades of all belligerents in a big attack.

I do not make this statement in any callous spirit, for I have lost too many valued friends myself to be callous about the loss of the younger men of the R.F.C. whom I have not the honour of knowing. But losses must occur in war, and the greater the results achieved the greater must be the losses.

The whole point is whether the result achieved is value for the losses suffered, and whether the same result might or could or should have been achieved at less cost. If the losses suffered on Friday and Saturday were due to the inferiority of our fighting machines, either in numbers or quality, then logically the results were achieved at too high a cost, for there is no excusable or explainable reason for such inferiority.

One is therefore tempted to wonder whether the statement that our machines were "shot down" was inserted into the G.H.Q. report on purpose to draw attention to a state of affairs which indicates that Sir Douglas Haig's demand of December 23rd, 1916, for "*a constant and liberal supply of the most up-to-date machines*" has not yet been fulfilled, and that the R.F.C. is still so equipped that, in Sir Douglas Haig's words, "*the most skilful pilots cannot succeed.*"

It might be well to have this point satisfactorily explained.

THE CLAIMS.

It may be well here to turn for a moment to the claims of the belligerents in the communiqués quoted above. If we suppose that the German figures are reasonably accurate, and that their fighting machines and guns brought down 41 of the Allies' machines, and if we take the British admitted loss of 28 as including the 3 engine failures—as seems reasonable—we should find 25 British machines shot down and 16 French. Which again seems a credible figure.

Or it might be that some of those 16 were British

machines which were seen to fall behind the British lines, in which case they may be set down as doubtful, in the same way as one must write off as doubtful a number of the "31 others driven down damaged" in the British communiqué. A machine which has been driven down damaged, unless the pilot is killed or seriously injured, is of no more consequence than a machine which is smashed in an aerodrome accident. The pilot merely brings out another machine and starts afresh.

Therefore we find that the only absolute certainty is that we have lost 28 aeroplanes complete with their pilots, and presumably some with passengers, and that we have destroyed certainly 15 enemy machines. The guarded phrase "a very large proportion"—totally destroyed out of the 31 others driven down—might mean anything from half a dozen upwards. Even so, a totally destroyed aeroplane does not entail a totally destroyed pilot, and at the finish it is the pilot who counts.

If we assume that 15 of the 31 were totally destroyed, and add the 15 known to be destroyed, we have 30 German machines to the credit of the R.F.C. Against this we have an admitted loss of 28 machines, plus whatever pilots may have been rendered unfit for further duty behind our own lines. Which does not indicate that we have as yet obtained that superiority in the air which is necessary to the winning of the war at the lowest possible cost.

AN ANONYMOUS AUTHORITY.

There is no reason for panic in this fact, but there is grave reason for dissatisfaction with those who are the cause of our not yet having won the war so far as air fighting is concerned.

That most valuable and reliable paper, "The Observer," published on Sunday last a statement from an anonymous "high authority," who says that "exaggerated reports of temporary checks and disadvantages have an injurious effect on the moral of the men in the Service who do not know and among the men who do know."

Frankly one disbelieves the statement. Nothing which has been published is as bad as some of the facts known to everybody in the Service, and the gallantry displayed by the R.F.C. in action last week, together with the remarkable results achieved, show that the moral of the Service is extraordinarily high. The endeavour to burke criticism by pleading that it has "an injurious effect on the moral of the men" is not only an insult to the men, but suggests that those criticised are at their last ditch for self-defence.

On his final remark one can echo exactly the authority quoted, subject merely to prefacing the echo with the word "almost." He says: "Everything possible is being done that can be done to increase the supply of the latest aircraft, and whilst we never know what surprises the Germans have for us, the strong chances are that we are all right."

The English is peculiar, but the sentiment is excellent. (Almost) everything is being done that can be done. There are still a few things more that might be done, but quite possibly they are about to be done. And there is no doubt that in due course the R.F.C. will be so equipped that it will obtain practically undisputed mastery, if not absolute supremacy in the air, owing to the natural superiority of our pilots over the Germans, and owing to the higher quality of our aeroplanes: possessions of this country which this paper has always strenuously upheld.

THE GREAT "BUT."

But, and here is the foundation and root and justification of all the criticisms levelled at the R.F.C. administration, why have we had to wait for more than two and a half years since the outbreak of war before

it is possible to say truthfully, "the strong chances are that we are all right"?

Everything that is being done to-day could have been done and ought to have been done at the beginning of 1916. Everything that was done a year ago could have been done and ought to have been done early in 1915. What will be done in a few months' time could have been done and ought to have been done months ago.

I leave out of the question the errors of the administration before the war, for, owing to Treasury parsimony, it was impossible to finance a big Flying Corps, and the administration had the choice of spending what money was available as it did or in other directions. That the choice was badly advised is to the discredit of the administration, but it does not affect, for practical purposes, the mistakes which have been made, nor the delays which have occurred, nor the labour and material which has been wasted since the war began and unlimited money was placed at its disposal. Bad choice of types of aeroplanes and engines, bad organisation of the supply of new and better types, bad handling of supplies of labour and material are responsible for the fact that our aviators have not to-day that permanent superiority over the enemy which is their birthright.

That so much has been done in the last few months to produce the machines and engines necessary to acquire that superiority reflects the very highest credit on those responsible for the improved state of affairs. That so little has been done in the past by those then responsible for equipment is gravely to the discredit of the administration as it then was. The responsibility rests on comparatively few people, but so long as those few remain in possession of any administrative power, they remain a possible source of danger to the welfare of our active-service aviators. And if they remain in office they will doubtless assume the credit for victory, when at length it comes.

A SOUND COMMENT.

The "Observer's" aeronautical correspondent says: "In the Services and in aeronautical circles there exists a widespread conviction that the Air Ministry has not even yet succeeded in putting on a proper basis the manufacture and delivery of the fastest and highest climbing aeroplanes, and that the old evil of preference for Government-designed machines and engines still exists. Unbusinesslike and wasteful contracts—the same trouble that was referred to nearly a year ago in these notes—are subjects of prevalent rumour still. It is said that aeroplanes and rigid-type airships, although of proved inferiority, are being made in large numbers. All these questions demand an immediate answer, or the present authorities will wake up one morning to find that an impartial investigation is being conducted over their heads."

Such an impartial inquiry, if it were possible, might discover curious offensive and defensive alliances between those responsible for the errors of the past and some of those responsible in theory for the successful efforts of the present, as well as between both and certain politicians who defend so vehemently the state of things as they were and are, instead of advocating and insisting upon the state of things as they ought to be. But such an inquiry is impossible, for it would interfere with too many vested interests and personal connections.

It must suffice that able and honest men are doing their best to put the equipment of the R.F.C. in a state which will give it the superiority over the enemy which Sir Douglas Haig demands. It must suffice that those able and honest men are succeeding in their task. And it will suffice if those on whom the blame truly rests are ere long promoted to such altitudes that they can retire gracefully into a distinguished oblivion.—C. G. G.

THE LATE HORACE SHORT.

Mr. Horace Short, the eldest of the Short Brothers, died on April 6th, at his residence in the Isle of Sheppey, at the age of forty-four. The cause of his death was the bursting of a blood-vessel in his brain. He became unconscious on the Tuesday evening and died on Friday. By all the older hands in aviation the news will be received with deep sorrow, and very many of the younger generation of Naval aviators will learn of his death with great regret.

Horace Short was one of the really big men of this world who have concerned themselves with the science of flying, for he possessed that faculty for attracting personal affection and at the same time inspiring a respect amounting almost to awe of his mental ability and force of character which is the possession of great men only.

By nature and education he was an engineer, and few engineers have done work of such high value, despite the fact that this is an engineering age. In his early years he led a life of adventure in remote parts of the world, drawn thither always by engineering work. Pearl-fishing in the Pacific came as easily to him as mining in Mexico, and those who have been privileged to listen to his tales of wild happenings in wild places know that his life, brief as it was, contained enough material to stock a library with books of adventure.

He possessed, moreover, the most wonderful versatility of mind, for he was far above the mental level of the ordinary adventurous engineer. It was almost impossible to produce a subject about which Horace Short did not know as much as the leading authority on the subject. The hard facts of bridge-building as applied to aeroplane girder design, the theories of aerodynamic science, the chemistry of internal combustion engines, the naval and military and commercial possibilities of aircraft were all within the ordinary scope of his daily work, but he was equally at home with advanced metaphysics, the legends of Lost Atlantis, the manners and customs and origin of the South Sea Islanders, the mural sculpture of the Aztecs, Egyptian hieroglyphics, and the operations of comets. I have heard him discuss those subjects in the course of an evening chat, and all with equally deep knowledge. His own theory of this earth's collision with a comet, as accounting for the Deluge, the glacial period, the distribution of human races, the arrangement of certain geological formations, and most of our primitive legends was one of the most astounding and at the same time most simply logical arguments I have heard. The world has suffered a great loss in not having Horace Short's adventures, commentaries, and theories duly recorded on paper.

After his engineering journeys abroad he settled down in England and worked with the Hon. Charles Parsons, now Sir Charles, on turbine experiments. How much of the success of the Parsons turbine was due to Horace Short only Sir Charles Parsons knows, but anyone who knew Horace Short could safely say that his collaboration was of immense value. In this respect alone he deserved well of his country.

Possibly by way of offsetting this benefit Horace Short was also concerned in the experimentation and production of that fearsome instrument, the Parsons Auxetophone, which by an evilly skilful use of compressed air produces from an ordinary gramophone record the devastating volume of a full brass band.

HIS AIRCRAFT WORK.

It was in 1908 that Horace Short first took seriously to the construction of aeroplanes, though he had long been interested in aeronautics, and had for some time been concerned with his brothers Eustace and Oswald

in the firm of Short Brothers, whose works were at Battersea, where they built spherical balloons, and held the appointment of official balloon-makers to the Aero Club of Great Britain, afterwards to become the Royal Aero Club.

The Aero Club had taken over a tract of marsh land at Shell Ness, near Leysdown, in the Isle of Sheppey. Here Horace Short established himself and the aeroplane works of Short Brothers. In those days aeroplane experimenters were scarce in England, but during 1909 the firm built machines for Mr. Frank McClean, Mr. Alec Ogilvie, the Hon. Maurice Egerton, the Grace Brothers, the late the Hon. Charles Rolls, and Mr. J. T. C. Moore-Brabazon, the last-named winning with a Green engine the "Daily Mail's" £1,000 prize for a flight of a mile over a closed circuit by an all-British aeroplane.

Subsequently the works were transferred to Eastchurch, where Mr. McClean had acquired a better aerodrome and had presented its use to the Royal Aero Club. In these works, which expanded year by year, were built some of the most interesting experimental machines ever made. The series of Short biplanes with two engines, driving variously a tractor and a pusher, two tractors and a pusher, and three tractors, were certainly the first multiple-engined aeroplanes in the world.

There were produced also, again for Mr. McClean, the three Short box-kites on which their Lordships of the Admiralty permitted Lieuts. Samson, Gregory and Longmore, R.N., and Gerrard, R.M.L.I., to be taught to fly by Mr. G. B. Cockburn.

Those were great days at Eastchurch. Other Naval and Marine officers and a complement of men were sent there, and the amount of flying done was prodigious for the period. The Naval Air Service Flying School was formed, which ultimately became the R.N. Air Station as it now is. Over it all, his own works, the R.N. sheds, and the R.N. Mess alike, Horace Short was a kind of presiding genius. A purveyor of good advice, a merciless and scathing critic, a trustworthy technical consultant, an originator of new and valuable ideas, and a conductor of far-seeing experiments in turn, he was at once a companion, a source of continual entertainment, and a rock of reliance to the young officers who were afterwards to do such good work in the King's Service.

THE GREAT SEAPLANE ACHIEVEMENT.

Perhaps the most valuable of all Horace Short's work was his production of the folding-wing seaplane, which was made in 1913 and became publicly known early in 1914. He had previously produced the older 100-h.p. and 160-h.p. Gnome-engined seaplanes with fixed wings, which had proved their ability to stand up to seas which no other hydro-aeroplane of the period dare face, but the "Short Folder" revolutionised the uses of seaplanes.

It made it possible to carry seaworthy aeroplanes on ships of moderate size, and it made it possible to house enormous aircraft in reasonable sheds. The work done by the Sunbeam-engined and Salmson-engined Short Folders in the Eastern Mediterranean, in Mesopotamia, and in East Africa is now historic.

During the development of the Eastchurch works Horace Short was assisted by his brother Oswald, who later took entire control of the works at Rochester, Mr. Eustace Short remaining in charge of the balloon factory at Battersea. Mr. Oswald Short is therefore thoroughly imbued with his late brother's ideas and system of construction, and consequently one may be satisfied that the various new ideas and designs which were in hand

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when Mr. Horace Short died will be continued and developed to their intended issue, so that much valuable work done by the brothers of late in conjunction will not be lost, as would have been the case if Horace Short had worked alone. Also, the firm of Short Brothers will remain as a permanent monument to one of the greatest men who have been concerned with British aviation.

The good, as well as the evil, that men do lives after them, and the good work done by Horace Short will

live for ever in the future greatness of the Royal Naval Air Service. Those of us whose great privilege it has been to call Horace Short friend need no reminder of his extraordinary personality, but to those who knew him less well I offer this as a slight and inadequate tribute to his memory. To his family I venture to offer on behalf of all who knew him our deep sympathy in their personal bereavement, and our sense of participation in a national loss.—C. G. G.

TRAINING.—XI.

BY "BERKELEY."

As The Hague Convention has been referred to several times in this series of pieces, it is perhaps well to explain the position in regard to the usages proper to the seemingly practice of the art of war. In early periods of the earth's history, mortal combat was waged without an encircling cordon of restrictions, and in the result the victor was often robbed of his due reward by the careless habits of universal destruction then prevailing. Little by little the unnecessary was eliminated from war, and was registered by mutual understanding throughout all the Powers commonly regarded as civilised. No written rules regulated the art of war, but an unwritten law recognised by all distinguished legitimate acts from outrages. Towards the close of the nineteenth century, an era in which public interest in war was almost non-existent, an attempt was made by several well-meaning States to codify the usages of the past. So by common consent The Hague Conference began its sittings. Most of the greater nations sent representatives to the various conventions which sat in 1899 and 1907. But the regulations propounded by the Conference were entirely unfulfilled (in so far as war on a large scale in Europe is concerned) by the clause which appears in all the appendices and reads as follows: "It shall cease to be binding from the time when, in a war between the contracting Powers, one of the belligerents shall be joined by a non-contracting Power." As one or other of the Powers engaged in the present conflict refrained from signing one or other of the various findings of the Conference, the rules laid down at the sittings are not legally binding. The Hague Conference served the purpose of recording in orderly manner the opinions of the Powers on the conduct of war. It made an excellent starting point, and its value in the present war is more real than apparent, an inversion of the usual order.

War cannot be waged entirely by rule. It is too intensely human in its origins and its practice for a continuous rigidity of action to be possible. Humanity combined with the law of military necessity alone will govern its paths.

The occupying army in territory wrested from an enemy may, as has been stated, requisition labour for the maintenance of such public works as are necessary for the continuance of the customary amenities of civilised life. The drainage system must retain its early perfection; the water supply must not cease its beneficent flow because a hostile flag flies in the place of power. But inhabitants cannot be compelled to labour in a manner which will aid the enemy in his operations against their own countrymen. But nothing in the customs of war can prevent the enemy from offering payment to such subjects of States owning the occupied territory as care to employ themselves in the furtherance of the victor's plan of campaign. The enemy can employ all who willingly undertake the work, but, as "The Laws and Usages of War" sapiently state, "It would, however, not be wise to use inhabitants indiscriminately for such purpose, since they might convey to the enemy information as to the nature of the works."

One clause of The Hague Convention which appears often to be forgotten, and which has little historical usage to support its terms, reads: "Article 50. No collective penalty, pecuniary or otherwise, shall be inflicted upon the population on account of the acts of individuals for which it cannot be regarded as collectively responsible." (Annex to the Convention. *Règlement concernant les lois et coutumes de la Guerre sur Terre*.) Often during the present war have the common enemy inflicted what in practice was a collective penalty for the offence of an individual. Perhaps this system could be extended to the conditions prevailing in times of peace, and a murder in Putney might be expiated by the summary execution of one per cent. of the inhabitants of that suburb. Ruthless though the act might be, murder would lose much of its popularity and would degenerate from the ranks of distinguished crime to the paltry disorder of a misdemeanour.

[In time of peace the community pays out of the rates for damages by arson or riot.—Ed.]

Though, as has been stated, an occupying army cannot force the inhabitants to transfer their allegiance from their legitimate monarch, the dwellers in the occupied territory may not therefore disobey proper orders given by the victor. Any act which, though based on allegiance to the dispossessed Government, is antagonistic or harmful to the occupiers can be and is punished.

The officials of the retreated Government who may remain behind can legitimately continue to carry out their routine duties if the conqueror desires their services. Usually municipal officials have remained at their posts, though those in the higher Government service have departed. It will be seen that it is a matter of duty for judicial, sanitary, and police authorities to remain behind, for they alone, taught by long experience, can aid the people whose means or condition have prevented them becoming refugees. It is putting a heavy task on the successful invader if he has to create an entirely new hierarchy of officials, none of whom will possess initial knowledge of local peculiarities.

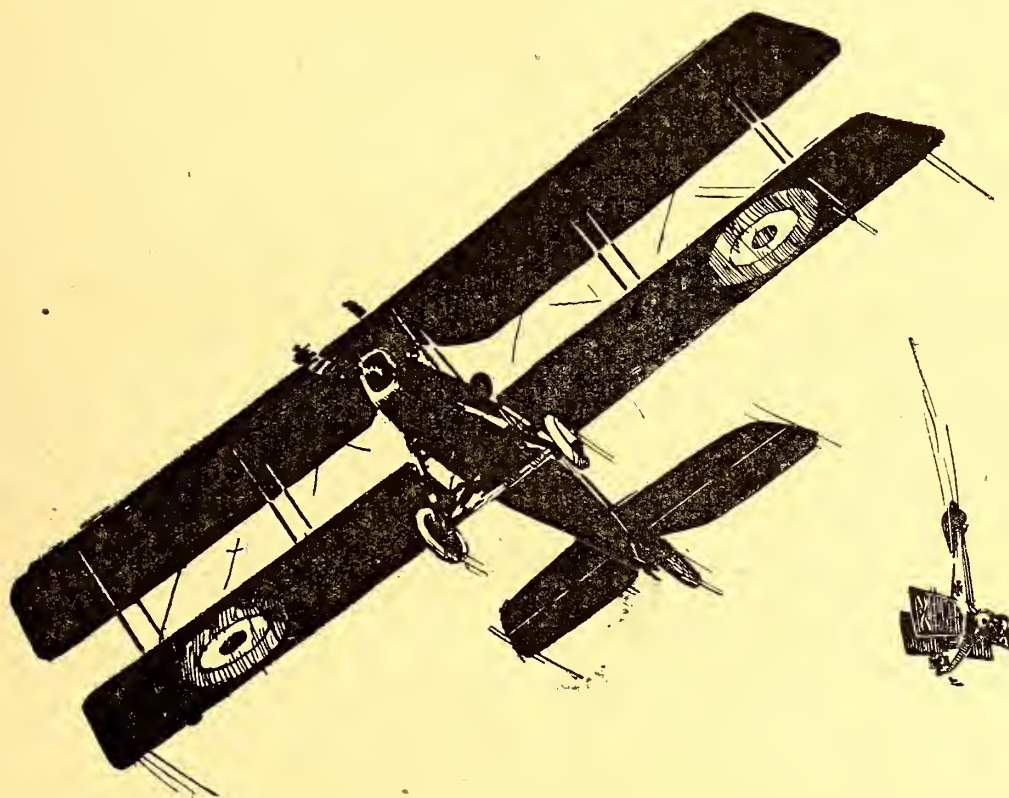
Officials who are retained in their positions are guilty of no offence against their true rulers. They give no new oath of allegiance, nor do they act in any way to the detriment of those to whom they owe prior duty. They are paid their ordinary salaries by the enemy, and can refuse to continue at their posts if they so desire. The occupant can, if he considers necessary, dismiss and replace any of them. Their lot cannot in truth be very pleasant. Distrusted by friend and foe, their emoluments are the same, and the expenses doubled, their present insecure and their future unpromising. But life in occupied territory is always more entrancing to the victor than to the vanquished!

PRISONERS OF WAR.

There is one phase of war in which the practice often fails to match the theory, and that is the treatment of prisoners of war. At one time in history it was not customary to take prisoners—the defeated enemy was simply extinguished, with no regard to the rights of humanity or a leader in the contemporary news-sheet.

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Good treatment they received while conditions were favourable, but they were the first to feel the coming of trouble.

All those who are intimately concerned in the prosecution of war and are officially recognised as such can be taken as prisoners of war. Thus not only are soldiers treated as such when captured, but also are members of the Government, civil officials, and so on, even to the journalist whose turgid periods stir patriotic fervour.

Chaplains and medical men must, if captured, be released as soon as may be possible, as they are exempt under the terms of the Geneva Convention, no less than under the customary usages of war. Offences against the enemy committed by these two classes would necessarily invalidate their claims to special treatment, but such crimes would also debar them from the privileges of a prisoner of war.

On capture, a prisoner of war must give his name and rank. There is, in fact, every reason why he should, for otherwise he will not receive the pay to which he is entitled, and which he would normally receive by international understanding from the army to which he has fallen prisoner. But though the enemy may by seductive methods endeavour to draw from the reluctant prisoners illuminating details regarding the numbers, composition, and movements of the army from which they have been separated, the captives cannot in any way be compelled to give a truthful answer, nor, if the reply be pleasing and inaccurate, can they be punished for their patriotic lies.

They are neither criminals nor convicts, and they must be treated accordingly. Such property as they may have on them at the time of capture cannot be taken from them, unless, indeed, they have in possession so large a sum of money as would give them unusual means of escape. They receive by right, if officers, the rate of pay of their rank according to the current scale in their own country, and the Power in whose hands they are recovers the amounts from their country.

Close confinement, the privilege of the skilful but unwary criminal, is not proper for the prisoner of war. He must be interned within a town, or, if space is not possible, in an enclosure, within whose bounds he must be free to roam. Offences against the military law of the Power in whose territory they are perforce residing can be punished as laid down in the military code of that Power. The sentence of death is not excluded.

"The object of the internment is solely to prevent prisoners participating further in the war. Any-

A USE FOR ORIGINALITY.

One would like to make a suggestion to the enterprising Government of America, which it can follow up with advantage to itself. We have in this country a member of Parliament named Pemberton-Billing who has rendered himself unpopular with those in high places through having been so tactless as, firstly, to tell the public much of the truth about their Flying Services something over a year ago, and, secondly, to make at the same time a number of suggestions for the improvement of those Services which the High Authorities have since, through sheer necessity, put into effect.

Mr. Pemberton-Billing's continued presence in Parliament therefore becomes, as he himself once put it, "a permanent obstacle to reform" in the Flying Services, for any reform carried out openly and thoroughly might be claimed by him as the result of his year-old advice. Consequently either his recommendations have to be put into effect slowly, and as unostentatiously as possible; lest he or other reform agitators should claim the credit, or they have to be postponed indefinitely in the hopes that the agitators will forget all about them and will not recognise their own children when they ultimately appear in public.

thing, therefore, may be done that may seem necessary to secure this end, but nothing more." ("Laws and Usages of War," paragraph 87.) The imprisonment must not wilfully be made unduly unpleasant.

One point which in these days of food shortage it is well to remember if justice is to be done to the enemy within our gates: "Prisoners of war must be given the same scale and quantity of rations, quarters, and clothing as the troops of the Government which captured them." This reads rather unpleasantly for soldiers captured by a dark tribe of mid Africa! That our enemy is reputed to ignore his obligations in matters of this sort does not absolve us, as a nation, from adhering to the code of gentlemen.

Under all recognised rules of war, prisoners of war, if properly paid, can be employed in any work which is not directly concerned with the operations of war. They cannot be employed in areas within reach of the guns of their fellow-countrymen.

Prisoners of war can, if the laws of their own country permit it, give their parole and be then set at liberty. They must in such cases adhere strictly to a high code of honour and carry out their engagement in the spirit as well as in the letter. An officer or man who would descend to trickery in the matter of release on parole is too despicable to be permitted to carry arms for his country. Their own Government cannot vary the terms of parole, nor influence the signatory thereto.

An officer who, having given his parole, again takes up arms for his country, is, if recaptured, liable to be tried by court-martial and sentenced to death.

During the Napoleonic wars many French officers lived in England on parole and in a state of perfect happiness unclouded by unpleasanties on the part of the public. Those were the halcyon days of war!

Each belligerent is expected to form an information bureau at the beginning of the war to deal with prisoners of war. All details concerning the captured should be registered at this office, which arranges for the transmission of lists to enemy countries in pursuance of the dictates of humanity. All effects of prisoners which are drawn from them on capture are stored here in waiting for the days of peace and freedom. The belongings of those who die pass this bureau for transmission home.

Parcels and letters from their home country reach the prisoners free of all duties and postal charges through the information bureau, or possibly through charitable societies to whom permission has been given by the Government.

As one may well imagine, recent ideas of his for the more efficient production and use of aircraft in war are not likely to meet with approval from the British authorities, no matter how sound or brilliant the ideas.

Now, American aviation does not suffer from the limitations imposed by political interests, so it appears that Mr. Pemberton-Billing's indisputable originality and ability might meet with appreciation and be used to advantage in the United States, whereas there are those in high places who will make very sure that he is never permitted to be publicly of use here.

Cross-country flying and bomb-dropping is easier and quicker to teach than is Army reconnaissance and artillery-spotting, and it would certainly help materially in the progress of the war, besides producing a very humorous situation, if Mr. Pemberton-Billing were first of all to go to the States to assist in producing a big fleet of bombardment aeroplanes, and afterwards to come back and show the European Nations how such a fleet can be used. Such seems the most useful function which the U.S. Army aviators can perform, and the function to which the genius of American manufacturers is best adapted, also thus there is an opportunity for using to good purpose the ability of the first M.P. for the Air.



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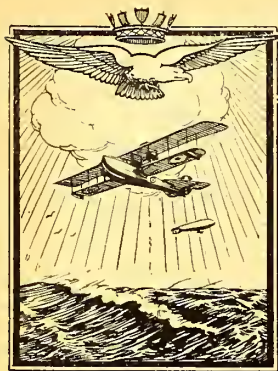
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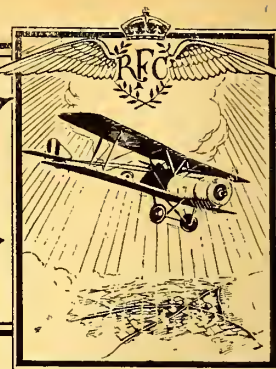
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FROM THE "LONDON GAZETTE."

[In accordance with representations made by various people interested in the Flying Service, it has been decided to extend the excerpts from the "London Gazette" published in this paper to include Flight Commanders and Equipment Officers (First Class), as being those from among whom the next Squadron and Park Commanders are chosen. Adjutants also will be included, as being of the nature of Staff Officers. The omissions of these appointments from last week's issue are made good herewith.—Ed.]

WAR OFFICE, March 27th.
REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Equipment Officers, 1st Cl., and to be temp. Capt. whilst so employed:—Temp. Lt. W. J. C. Brown, Gen. List, from a Staff Lt.; Sec. Lt. (temp. Lt.) L. Auker, Gen. List, from the 2nd Cl., March 14th.

* * *

WAR OFFICE, March 28th.
REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Adjutants.—Temp. Sec. Lt. W. O. Thomas, M.C., Gen. List, from a Flying Officer (Observer), vice temp. Lt. A. Murray, Gen. List, Feb. 10th. Lt. E. N. E. Waldron, Ind. Army Res. of Off., vice Capt. H. C. C. Morley, E. Kent R., Feb. 17th.

* * *

WAR OFFICE, March 29th.
REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Flight Commanders.—From Flying Officers:—Sec. Lt. (on prob.) B. H. E. Howard, M.C., Manch. R., Spec. Res., and to be temp. Capt. whilst so employed, Dec 24th, 1916. Temp. Capt. J. C. M. Hay, Gen. List, Feb. 6th. Capt. J. T. Waller, Leic. R., March 1st. And to be temp. Capt. whilst so employed:—Temp. Lt. J. Morris, Gen. List; Sec. Lt. N. Kemsley, Spec. Res.; Lt. K. L. Gopsill, E. Surr. R., Spec. Res.; temp. Lt. H. S. Paynter, Gen. List; temp. Lt. S. G. Kingsley, Gen. List; Lt. S. F. Vincent, Spec. Res.; temp. Lt. F. J. Terrell, Gen. List; Sec. Lt. (temp. Lt.) W. R. S. Wilberforce, K. R. Rif. C.; Lt. G. Merton, Spec. Res.; temp. Lt. C. M. Gibson, Gen. List; temp. Lt. F. H. Furness-Williams, Gen. List; temp. Lt. T. H. McDowell, Gen. List; Sec. Lt. (temp. Lt.) R. S. Lucy, Worc. R., T.F.; Lt. A. R. Johnston, High. L.I., Spec. Res.; Lt. C. L. H. Hicks, Spec. Res.; temp. Lt. L. E. Whitehead, Gen. List; Sec. Lt. (temp. Lt.) J. McKelvie, R.E., T.F.; Lt. G. H. B. Streatfeild, Durh. L.I., Spec. Res.; Lt. P. Tremlett, Spec. Res.; Sec. Lt. W. R. C. Dacosta, Spec. Res., March 1st.

* * *

WAR OFFICE, March 30th.
REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Flight Commanders.—From Flying Officers, and to be temp. Capt. whilst so employed:—Temp. Sec. Lt. (temp. Lt.) L. S. Ward-Price, Res. R. of Hhd. Cav., March 14th. Sec. Lt. (temp. Lt.) C. E. M. Pickthorn, A.S.C., Spec. Res.; Sec. Lt. F. H. B. Selous, R. W. Surr. R., March 21st. Temp. Lt. B. C. Rice, Gen. List, March 24th.

Equipment Officers, 1st Cl.—From the 2nd Cl., and to be temp. Capt. whilst so employed:—Lt. L. A. McDougald, Spec. Res., Jan. 29th. Sec. Lt. (temp. Lt.) C. F. J. North, Spec. Res.; Sec. Lt. (temp. Lt.) J. N. D. Heenan, Spec. Res., March 1st. Temp. Hon. Lt. W. E. Reason, Gen. List, and to be temp. Capt. whilst so employed, March 14th.

* * *

WAR OFFICE, April 2nd.
REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Flight Commander.—Sec. Lt. (temp. Lt.) E. K. Anderson, High. L.I., T.F., from a Flying Officer, and to be temp. Capt. whilst so employed, March 17th.

* * *

WAR OFFICE, April 3rd.
REGULAR FORCES—ESTABLISHMENTS.—P.F.C.—MIL. WING.
—Squadron Commander.—Lt. (temp. Capt.) G. R. M. Reid, M.C. Arg. and Suth'd Highrs., Spec. Res., from a Flt. Comdr., and to be temp. Maj. whilst so employed, Feb. 10th.

Flight Commanders.—From Flying Officers, and to be temp. Capt. whilst so employed:—Temp. Lt. P. D. Stuart, Gen. List,

March 17th. Temp. Sec. Lt. J. H. Norton, Gen. List, March 18th. Sec. Lt. H. H. Baron, Spec. Res., March 19th. Temp. Sec. Lt. K. Crawford, Gen. List, March 21st.

* * *

WAR OFFICE, April 4th.
STAFF.—Temporary appointments at War Office:—G.S.Os., 1st Grade.—Bt. Lt.-Col. B. C. H. Drew, Ind. Army, from the 2nd Grade, vice Bt. Lt.-Col. L. E. O. Charlton, C.M.G., D.S.O., Lan. Fus., Feb. 28th, 1917.
2nd Grade.—Bt. Maj. B. C. Fellows, ret. pay, Ind. Army, from a Dep. Asst. Dir., vice Bt. Lt.-Col. B. C. H. Drew, Ind. Army, Feb. 28th, 1917.

Staff Lt.—Sec. Lt. H. G. Day, R.F.C., Spec. Res., vice Lt. (temp. Capt.) G. Dugdale, Yeo., T.F., March 8th, 1917.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Flight Commanders.—From Flying Officers, and to be temp. Capt. whilst so empld.:—Lt. E. E. Hodgson, Spec. Res., with seny. from Jan. 1st, 1916, without the pay prior to March 20th, 1917. Temp. Lt. H. E. Bagot, Gen. List, March 20th.

Eqpt. Officers, 1st Cl.—Sec. Lt. (temp. Lt.) W. M. Cumming, Spec. Res., from 2nd Cl., and to be temp. Capt. whilst so empld. March 8th.

MEMORANDA.—Sgt. J. Hooper, from R.F.C., to be temp. Sec. Lt. for duty with the Mil. Wing of that Corps, Jan. 27th. (Substituted for the notification in the "Gazette" of March 13th.)

The following from R.F.C. to be temp. Sec. Lts. for duty with the Mil. Wing of that Corps.—Flt. Sgt. G. Baillie, July 2nd, 1916. Sgt. J. Leaske (since killed), Feb. 24th.

* * *

WAR OFFICE, April 5th.
R.F.C., MIL. WING.—ESTABLISHMENTS.—Lt. C. G. Beatson, Midd'x R., Spec. Res., to be Adj., vice Sec. Lt. A. H. Stradling, Gordon Highrs., T.F., Feb. 8th, 1917.

Adj.—Temp. Capt. C. J. Foot, R.A., vice Capt. R. J. H. Purcell, K.R.R.C., Feb. 23rd, 1917.

* * *

The following name is added to the names of those which have been brought to the notice of the Secretary of State for War for valuable services rendered in connection with the war.—O'Gorman, Lieut.-Col. M. J. P., C.B., R.F.C.

THE COURT CIRCULAR.

BUCKINGHAM PALACE, April 4th.
The following Officer had the honour of being received by the King this morning, when His Majesty invested him with the insignia of Companion of the Order into which he has been admitted:—

THE DISTINGUISHED SERVICE ORDER.
Major Cecil Kilner, R.M.L.I. and R.N.A.S.

The King then conferred decorations as follows:—

THE DISTINGUISHED SERVICE CROSS.
Flt. Comdr. William Moore, R.N.A.S.

THE MILITARY CROSS.
Major Reginald Chedwick, R.F.C.
Captain Patrick Huskinson, Sherwood Foresters and R.F.C.

NAVAL.

ADMIRALTY COMMUNIQUÉ.
APRIL 8th.—Vice-Admiral Dover reports:—Attacks were carried out on Zeebrugge Mole by seaplanes of the Royal Naval Air Service on the night of April 7th-8th, and many bombs were dropped.

Attacks were also made in co-operation with the military on ammunition dumps, on Ghent, and Bruges
All machines returned safely.

THE CASUALTY LIST.

Reported April 5th.
KILLED.—Morgan, Flt. Lieut. John E., R.N.
MISSING.—Ingham, Flt. Sub-Lt. Joshua M., R.N.
PRISONER.—Treichmann, Flt. Sub-Lieut. Bertram A., R.N.

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KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.

Reported April 9th.
MISSING, BELIEVED KILLED.—Flt. Sub-Lt. Robert K. Slater, R.N.
INJURED.—Flt. Sub-Lt. Douglas W. Gray, R.N.
 Flt. Sub-Lt. Maurice R. Kingsford, R.N.

PERSONAL NOTICES.

ENGAGEMENT.

HODSON—MARRINER.—An engagement is announced between Flt. Sub-Lieut. Neville G. Hodson, R.N., son of the late Mr. John Hodson and Mrs. Hodson, 6, Glendale Road, Hove, and Phyllis Margaret, youngest daughter of Mr. Arthur H. Marriner, of Keighley, Yorkshire, and Mrs. Marriner, of 24, Portland Court.

MARRIAGES.

EDMONDS—OSBORN.—The marriage took place very quietly at the Church of St. John the Evangelist, Paddington, on April 5th, between Squadron-Commander Charles Humphrey Kingsman Edmonds, D.S.O., R.N., son of Mr. and Mrs. Charles Edmonds, of Lymington, Hants, and Lorna Karim Chadwick Osborn, daughter of Colonel George Osborn, R.A., and granddaughter of the late Robert Chadwick, J.P., of Sydney, New South Wales.

[Squadron-Commander Edmonds was one of the earliest of R.N. officers to join the R.N.A.S., and is a Lieut., R.N. He passed through the Central Flying School, under Captain Godfrey Paine, and did good work in the R.N.A.S. before the war. He won his D.S.O. by sinking a Turkish transport in the Marmora with a "projectile" from a seaplane, flying over the Gallipoli Peninsula from the Aegean to reach his objective. The feat was the first of its kind in the history of war. All will wish him and his bride long life and happiness.]

SAMSON—STOREY.—On April 7th, at Colombo, Ceylon, Commander Charles Rumney Samson, D.S.O., R.N., second son of Mr. and Mrs. Charles L. Samson, of 2, Montagu Square, W., to Honor, only daughter of Herbert L. Storey, Esq., J.P., D.L., of Bailrigg, Lancaster.

[Commander Samson's services during the war are already familiar to all concerned with aviation. It is, therefore, one's pleasant duty to wish him and his bride every good fortune, and to hope that when they return to England it may be in order that Commander Samson may reap further honours.—C. G. G.]

MILITARY.

G.H.Q. COMMUNIQUÉ.

APRIL 3rd, 8.15 p.m.—Two German aeroplanes were brought down by gun fire yesterday, one of which fell in our lines.

In air fights four German machines were brought down and two others were driven down damaged. Six of our machines are missing.

APRIL 4th, 8.27 p.m.—There was considerable activity in the air yesterday, and a number of fights took place, in the course of which one German aeroplane was brought down. Five of our machines are missing.

APRIL 6th.—Yesterday and on the night of the 4th and 5th inst. several long distance raids were carried out by our aeroplanes, and a number of important railway junctions, munition depots, and aerodromes were successfully bombed.

APRIL 7th.—During the days and nights of April 5th and April 6th our aeroplanes have been very active, continually harassing the enemy's communications a long way in the rear and seeking out his fighting machines at a considerable distance behind his lines.

Large tracts of enemy's country many miles in rear were photographed, over 1,700 photographs being taken behind the enemy's lines.

Co-operation with artillery continued during daylight, unhindered except by weather, although repeated attempts were made by the enemy to prevent this important work.

Seventeen successful bomb raids were carried out on enemy aerodromes, ammunition depots, and railways a long distance behind the lines, in addition to numerous small raids. A total of over 8 tons of bombs were dropped.

All the time intense fighting between large formations took place. Our casualties are 28 machines missing, a large number of which are known to have been shot down in combat over the enemy's country.

It is known that the enemy suffered very heavy casualties. In one case an observer was seen to fall out of his machine, which went down out of control in a spin, and in another the fighting was so close that the enemy pilot was seen to fall forward, his machine nose-diving out of control. 15 hostile machines were driven down and actually seen to crash, while 31 others were driven down damaged, a very large proportion of which must have been totally destroyed. In addition 2 hostile balloons were brought down in flames.

APRIL 8th.—Several bombing raids were carried out by our aeroplanes yesterday and during the previous night. Large quantities of explosives were dropped on aerodromes, stations, transport, and on a battery in action, and good results were observed.

In one German aerodrome three hangars were destroyed, and possibly a fourth, and a group of buildings in the neighbourhood were also hit by our bombs.

Hostile trains were also attacked with success by machine-gun fire. A German kite balloon was successfully attacked and destroyed.

APRIL 9th, 9.55 p.m.—The aerial activity of the past few days was continued yesterday with great energy.

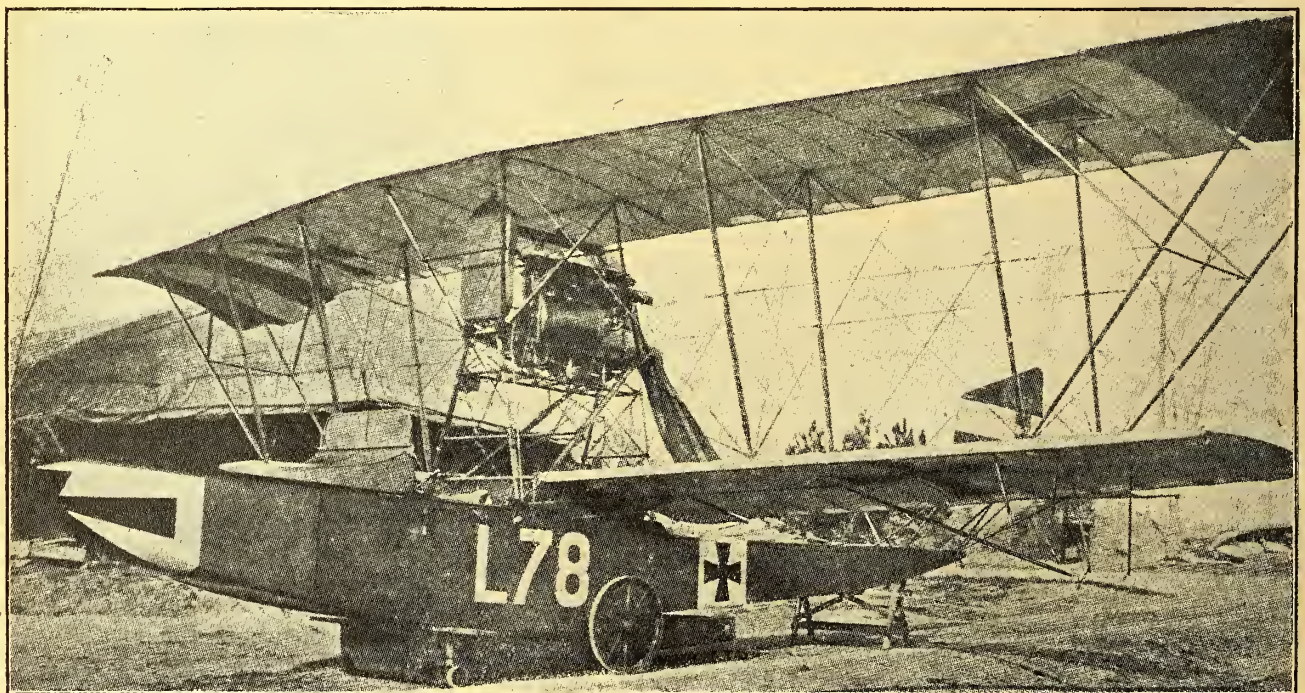
Several successful bombing raids were carried out by us, and our machines co-operated with our artillery with excellent results.

Two hostile machines were destroyed and 15 others were driven down and probably crashed. Two German kite balloons were brought down in flames.

Ten of our aeroplanes are missing.

WAR OFFICE COMMUNIQUÉ.

The General Officer Commanding British Forces in Macedonia reports:—

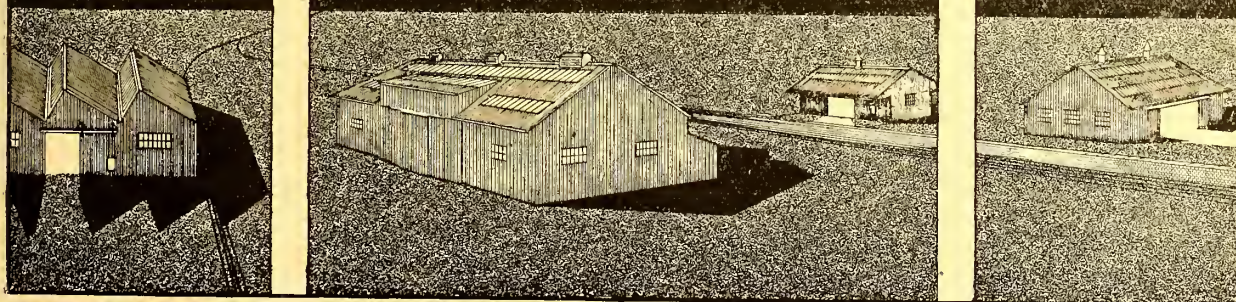


Reproduced from "La Guerra," the Italian Official Publication.
 A Lohner Flying Boat of a type slightly different from that which was illustrated in "The Aeroplane" last week.

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KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.

APRIL 7th.—During the past week our aircraft have continued to show much activity. Naval and military machines, descending to 400 feet, have bombed on several occasions the enemy aerodrome and ammunition dumps of Hudova. Fires were observed to break out, and considerable damage was inflicted.

HOME COMMAND COMMUNIQUE

The following communiqué was issued on April 6th by the Field-Marshal, C.-in-C., Home Forces:—

A hostile aeroplane passed over certain Kentish coast towns at about 10.45 p.m. last night.

Eight bombs were dropped, most of which fell in the open.

No casualties were caused and no damage resulted beyond the breaking of some glass.

THE CASUALTY LIST.

KILLED.—Caffyn, Lt. C. McC. H. M., E. Surrey Regt., attd. R.F.C.
Stretton, Lt. S., R.F.C.

INDIAN FORCES.

PREVIOUSLY UNOFFICIALLY, NOW OFFICIALLY REPORTED KILLED.—Buck, Lt. C. M., Indian Army Reserve of Officers, attd. R.F.C.

Reported April 5th.

WOUNDED.—Lloyd, Sec. Lt. R. H., R.F.C.

Taylor, Sec. Lt. W. D. B., R.F.C.

MISSING.—Knight, Sec. Lt. N. L., R.F.C.

Severs, Sec. Lt. A. G., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Bird, Lt. C. B., R.F.A., attd. R.F.C.

Holley, Lt. T. G., Canadian Infantry, attd. R.F.C.

DIED OF WOUNDS.—R.F.C.—Hazell, 18046 1st Cl. Air Mech. J. S. (London, W.C.).

Longley, 8203 1st Cl. Air Mech. G. C. (Chatham).

DIED.—R.F.C.—Ironsides, 52755 2nd Cl. Air Mech. W. (Aberdeen).

WOUNDED.—R.F.C.—Davin, 61912 2nd Cl. Air Mech. I. G. (Londonderry).

PREVIOUSLY REPORTED RELIEVED TAKEN PRISONER AT KUT-EL-AMARA, NOW REPORTED PRISONER.—R.F.C.—Campbell, 445 Flt.-Sgt. H. (Sherborne, Dorset).

Reported April 6th.

MISSING.—Garnett, Lt. W. P., R. Berkshire, attd. R.F.C.

Sinclair, Lt. D. M. F., R.F.C.

Clifton, Sec. Lt. W. G. T., Oxon and Bucks, L.I., attd. R.F.C.

KILLED.—MacKenzie, Lt. A. S., R.F.C.

ACCIDENTALLY KILLED.—Hamphill, Sec. Lt. R. P., Leinster, attd. R.F.C.

WOUNDED.—Wynne, Capt. A. M., R.F.C.

Reported April 7th.

KILLED.—Gibbs, Sec. Lt. C. C., R.F.C.

WOUNDED.—Dell-Clarke, Sec. Lt. G. C., R.F.C.

Dempsey, Capt. J. A. D., R.F.C.

Knight, Lt. O. R., Queen's (R. West Surrey) and R.F.C.

MISSING.—Dickins, Capt. W. A., M.C., S. Staffs.

Weloh, Sec. Lt. H., R.F.A. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Appleton, Sec. Lt. A., R.F.A. and R.F.C.

Reported April 10th.

DIED OF WOUNDS.—Duncan, Lt. H. F., Highland L.I. and R.F.C.

WOUNDED.—Poole, Sec. Lt. H. W. L., Duke of Cornwall's L.I., attached R.F.C.

MISSING.—Powell, Lt. P. J. G., A.S.C., attached R.F.C.

Sworder, Lt. H. P., R. W. Surrey Regt., attached R.F.C.

Tomlinson, Capt. H., M.C., R.F.C.

Williams, Sec. Lt. V. F., R.F.C.

PERSONAL NOTICES.

DEATHS.

BOWER.—Sec. Lt. Frank Bower, Northumb. Fus., attd. R.F.C., who died of wounds received in action on March 31st, was the younger son of Mr. and Mrs. Joshua Bower, of Somerford Keynes, Cricklade, Wilts, and grandson of Mr. Thomas Bower, of Stradishall Place, near Newmarket. He was commissioned in August, 1916, and was gazetted Flying Officer in the following December.

* * *

CAFFYN.—Lt. Chaloner McCrae Caffyn, East Surrey Regt., attached R.F.C., aged 24, son of the late Stephen Mannington Caffyn and Mrs. Mannington Caffyn ("Iota"), was killed on March 28th. He was educated at Miss Colebrook's School, Southsea, Cheltenham College, and the University, Zurich. He joined the East Surrey Regiment early in the war, and after 18 months' service in the trenches was seconded to the R.F.C.

His colonel says:—"He was a fine and fearless pilot, and though he had only been in this squadron for a few days, he had already made a position for himself."

Mr. Caffyn played for England in the International Ice Hockey contest in Zurich shortly before the war. His brother, Capt. Caffyn, North Stafford Regt., was killed in France on March 21st, 1915.

CHAPPEL.—Lt. William Eldon Chappel, D.C.L.I., attached R.F.C., who was accidentally killed while flying on April 4th, was the younger son of Mr. and Mrs. Herbert E. Chappel, of 31, Pemberley Avenue, Bedford, aged 19.

* * *

COLLINS.—Sec. Lt. Arthur Duppa Collins, R.F.C. (died of wounds April 1st), was 22 years of age, and only son of Mrs. W. P. Collins, of Lingfield Avenue, Kingston-on-Thames, and formerly of Beckenham. He received his commission in January.

* * *

GRAY.—Sec. Lt. G. T. Gray, R.E., attached R.F.C. (killed in action on March 24th), was second son of Mr. and Mrs. J. Gray, The Red House, Ruislip. He had his commission in the Royal Engineers in Dec., 1915.

* * *

MURRAY.—Lt. Antony Archibald Murray, Canadian Infantry, attached R.F.C., was born in Bangalore, India, and educated at the Royal High School, Edinburgh. He was the younger son of Captain John Murray, R.H.A., and Mrs. Murray, of Gala Bank, Dunbar, and of Edmonton, Canada. After 18 months' service with his regiment Mr. Murray returned to England on Feb. 1st last for a short training in the R.F.C., and was killed while flying on March 19th.

* * *

PEACOCK.—A verdict of accidental death was given on April 7th in the case of Sec. Lt. W. Hubert Peacock, aged 21, a Canadian attached R.F.C. He was a qualified pilot. While flying at a hundred feet he made a steep turn and shut off the engine, and the machine turned over and nose-dived, the pilot being killed instantaneously.

It was stated to be an error of judgment to shut off the engine while turning so low, though it could be done at a greater height. Replying to the Coroner, the C.O. denied the truth of the allegation that young pilots were sent up before it was safe for them to do so. He had never known such a thing to happen.

* * *

PORKESS.—Lt. Walter Anderson Porkess, R.F.C. (killed in action Feb. 10th), was the youngest son of Mr. W. Porkess, of Grimsby. He was on the staff of Messrs. Ambrose Heal and Son, London, when he enlisted soon after the outbreak of war. After six months in the Royal Bucks Hussars, he was transferred to the Inns of Court O.T.C., and later obtained a commission in the Sherwood Rangers Yeomanry, from which regiment he was attached to the R.F.C. He won his "wings" very quickly.

His Squadron Commander writes:—"Your son died instantaneously, serving his country in the stoutest manner imaginable. . . . During the four days prior to the attack your boy has ranged on no less than six German batteries, doing invaluable work, having been thanked many times by the Colonel at the Wing. On the very day of the attack his machine was hit by anti-aircraft fire while ranging. . . . His machine fell in our lines."

* * *

STEVENSON.—Sec. Lt. Douglas B. Stevenson, Duke of Cornwall's L.I. and R.F.C., youngest son of Mrs. L. R. Stevenson, of Greenwich, and grandson of the late Capt. B. Anderson, was born in 1895, and educated at Christ's Hospital and King's College School. At the outbreak of war he enlisted, and was subsequently given a commission in the Duke of Cornwall's Light Infantry. He went to the front in July, 1916, and was attached to the Yorkshire Light Infantry. He was transferred to the R.F.C. in February, 1916, and was killed on March 11th.

* * *

STRETTON.—Lt. Sidney Stretton, R.F.C., who died on March 27th of wounds received while flying, was the elder son of the late Benjamin Stretton and of Mrs. Stretton, of Hammerwich House, near Lichfield, aged 28.

* * *

VENABLES.—Lt. A. E. Venables, R.F.C., was killed in a Northern town on April 4th. His machine caught fire when alighting, and he was burnt to death.

* * *

WARREN.—A verdict of "Accidental death" was returned at an inquest which was held on April 5th on the body of Harry Collier Warren, aged 23, a cadet in the R.F.C., who was flying as a pupil in a machine with Sec. Lt. Claud Lowery as pilot. It was stated that the machine began to spin, and in spite of the efforts of the pilot the controls would not work properly. It was possible, however, that the rudder was jammed by air pressure. This was Mr. Warren's second trip.

ENGAGEMENT.

HILL—MOIR.—The engagement is announced of Lt. Alan P. Dunlop Hill, R.A. and R.F.C., son of the late Mr. and Mrs. Dunlop Hill, London, and Noël Gordon, youngest daughter of Dr. and Mrs. Moir, St. Andrews. The wedding will take place at an early date, dependent on leave.

MARRIAGES.

HILL—PLOWMAN. On April 4th, 1917, at Holy Trinity Church, Reading, by the Rev. H. Elton Lucy, C.F., Brian E.

(Continued on page 942.)

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The British Aircraft Industry.

BY CHARLES L. FREESTON.

(Founder Member of the Royal Aero Club.)

XI.—THE BLACKBURN AEROPLANE AND MOTOR CO., LTD.

The pioneers of the aircraft industry took up their work in varying capacities, but Mr. Robert Blackburn is one of the select band of those who designed, built, and flew their own machines. Aviation attracted him almost at the outset of his professional career. He took his A.M.I.C.E. in 1906, when 21 years of age; spent a year under his father's supervision obtaining valuable experience at Leeds; travelled and studied in Germany for two years; and then, early in 1909, found himself in Paris.

The Channel had not then been flown, nor had the great Reims Meeting of August, 1909, arrived—the two events which did so much to stimulate interest in aviation beyond the French borders; but the aeroplane was none the less "in the air" in a literal and figurative sense alike, and Mr. Blackburn at once became an enthusiast for the new means of locomotion.

With such promptitude did he set about the realisation of his new-found faith that within a month of his witnessing a flight at Issy he had designed his first machine in Paris, then built it at Leeds, and in April was flying it himself at Saltburn.

A FIRST ATTEMPT FLIGHT.

It left the ground at the very first attempt, and thus enabled Mr. Blackburn to fill the triple bill of designer-builder-pilot eight years ago from now.

The machine was a monoplane of 28 ft. span, with a 35-h.p. Green motor, chain drive, and a slow-running propeller. The centre of gravity was very low, and when Mr. Blackburn, fired by his initial successes with straight flights, came to attempt a turn, he "crashed" and was flung out, but fortunately without serious injury to himself, though the machine itself was wrecked.

In no way daunted by this mishap, Mr. Blackburn addressed himself to the task of designing a better machine, and this was got ready by the time of the second Blackpool meeting, in 1910, with the important exception of the engine, a 50-h.p. Isaacson. As this did not materialise until later, the Blackburn was unable to compete.

A NOTABLE RECRUIT.

Before very long, however, the afterwards redoubtable B. C. Hucks appeared upon the scene, and it is interesting to note that he learned to fly, and obtained his pilot's ticket, on the

second Blackburn machine. This was in February, 1911, and the brevet was not secured without a decidedly disturbing contretemps, for, while Mr. (now Captain) Hucks was doing his last turn, the engine burst asunder in mid-air.

A couple of months later Mr. Blackburn obtained his first 50-h.p. Gnome, and, others following, he built several more machines. He then started building with 80-h.p. Gnomses. But there was no trade to be done, of course, in aeroplanes in those days, and all that was left to this enterprising young Yorkshireman—who is even now only in his thirty-third year—was to organise exhibition flights up and down the country.

GOOD WORK.

These were carried out by Mr. Hucks with great success, and began immediately after the "Circuit of Britain" race. Mr. Hucks was himself a competitor in that event, and started very well, with a quick rise, and made good time to Hendon. On the second stage, however—Hendon to Harrogate—the engine started missing several miles beyond Luton, and the pilot deemed it prudent to descend. He landed in a field, however, surrounded by a barbed wire fence and carried the chassis clean away.

Both the machine and engine were repaired in twenty-four hours by Mr. Blackburn and his men, but Mr. Hucks thought that there was too much leeway to be made up, and flew back to Hendon. A second Blackburn in the race had Mr. (now Lt.-Col.) Conway Jenkins as pilot, but had an accident at the start.

ENERGETIC EXHIBITIONS.

Then Mr. Hucks began that very memorable tour in the West Country. Its educational effects were invaluable, for during a period of three months he was adhering to a programme of defined dates, at a time when the public had become imbued with the idea that an aeroplane was a fair weather machine pure and simple, and that to see a flight at all meant a wait of several hours at an aerodrome, with no one taking the air until perhaps six o'clock in the evening.

Mr. Hucks demonstrated the contrary, for he visited Taunton, Burnham, Minehead, Weston-super-Mare, Cardiff, Newport, Cheltenham, Gloucester, and other places, and everywhere he went up at the appointed time, save on two occasions. Nor did he have prepared fields, in the absence of aerodromes, for either starting or landing purposes, but had often to alight on very bad ground.

In all he made no fewer than ninety separate flights, covering



Mr. Robert Blackburn.

about a thousand miles in all, and incidentally he flew three times across the Bristol Channel. The Blackburn machine itself won golden opinions on the score of general reliability and its capacity for withstanding hard wear, particularly in respect of landing on shocking grounds.

In one instance it had to come down on a cabbage farm near Cheltenham, and ploughed up many yards of cabbages with its skids, but without experiencing any damage. As a matter of fact, it had only one real mishap, and that was when a wheel came off on landing, and, rolling forwards, got mixed up with the propeller, which it smashed. An incident of minor importance was the rolling forward of the machine, at another landing, until it reached a hedge, but the bending of the leading edge of the wing was the only resultant damage.

On the ground, however, the Blackburn had one narrow escape. It was being got ready for flying at Gloucester, when a storm sprang up and caught hold of the canvas hangar in which it was stabled. Both the machine and the hangar were lifted clear of the ground, and the mechanics had to run for their lives. When the gust had subsided, the canvas of the tent was hanging on top of the machine and the planes. It withstood the load, nevertheless, and in the afternoon was ready for flying again, Mr. Hucks making three flights in a very strong and gusty wind to appease the crowd.

A noteworthy incident in connection with this tour was the fact that it was made the occasion of a demonstration of wireless telephony. Mr. H. G. Matthews, the inventor of a new system, was able to receive verbal messages quite easily and distinctly from Mr. Hucks when the latter was flying at fifty miles an hour across a strong breeze, at a height of 700 ft. According to an observer of the time the demonstration "at least quadrupled the aeroplane's military value." The London papers paid quite a considerable amount of attention to the event.

The crossing of the Bristol Channel made a very decided impression on the people of the West Country, especially when Mr. Hucks did the double journey without alighting. He left Weston-super-Mare at 5.10 a.m., accompanied at the start by a steam launch, which he speedily left behind. By the time he had reached Cardiff he had attained a great height, and then encircled the city, but without alighting he flew back to Weston-super-Mare, where he made a faultless landing at his starting-point. The Channel is 16 miles across between Weston and Cardiff, and the whole flight occupied 40 minutes in all. It was witnessed by huge crowds on both banks.

AN ALL-STEEL MONOPLANE.

Towards the end of 1911 Mr. Blackburn produced a two-seater all-steel monoplane, designed primarily for military purposes. Its chief element of novelty lay in the fact that the framework was not welded or soldered, in accordance with previous practice where all-steel machines were concerned, but had all its parts built up into the structure and riveted to specially designed clips. The various members, therefore, were readily detachable, to a greater degree even than in a wooden machine, as well as being quickly replaceable in case of damage. The standardisation of all the parts conferred an additional advantage. Oval steel tubing was used throughout the body and chassis, while the main spars in the wing framework were of heavy round tubing, the only wooden parts in the whole structure being the ribs, mast, and skids.

Its span was 38 ft. 4 in., with a 9 ft. chord at the root and 7 ft. at the tips. The plane area was 290 sq. ft. With a 50-h.p. Gnome motor the machine weighed 750 lb. net., and with a 60-h.p. Renault 950 lb. net. Mr. Blackburn, by the way, was the first constructor to fit a Renault motor on a monoplane.

THE BLACKBURN SCHOOL AND TOURING WORK.

For about 18 months Mr. Blackburn ran a flying school at Hendon, under the management of Mr. Harold Blackburn, who, curiously enough, was not a relative, though a namesake. Then Mr. Harold Blackburn (now Major R.F.C.) went north in order to engage in exhibition flights. These were performed on an 80-h.p. Gnome-engined machine, and later he left the firm and went into a sporting partnership with Mr. M. G. Christie, a Doctor of Science (now also Major R.F.C.). Each piloting in turn an 80-h.p. Blackburn, the pair did a great deal of cross-country work for a period running into two years, and it is almost needless to say that these exhibition flights were of considerable educational advantage. Though now engaged, of course, on sterner work, the pilots can look back with a considerable degree of satisfaction upon their joint achievements. Dr. Christie still cherishes an affection for his 80-h.p. Blackburn, and in a letter to Mr. Robert Blackburn which I have seen he refers to it as "a most excellent bird in its day." The immunity from mishaps during that period speaks well for the strength of the Blackburn.

Another pilot who did exhibition work on an "eighty" before the war was Mr. Sidney Pickles. At the Yorkshire Agricultural Show he carried a good many passengers, among whom were the Lord Mayor of Leeds (Colonel Brotherton) and the Lady Mayoress. Colonel Brotherton is a very heavy man, but Mr. Sidney Pickles got him off practically in a gale and made a journey from Leeds to Bradford.

Lieut. (now Wing Commander) Spenser Grey, R.N., D.S.O., was another well-known and skilful pilot who used a Blackburn

monoplane to good effect. He bought one of the all-steel machines, and flew frequently at Brooklands. While stationed with his ship on the coast, moreover, he had his machine with him, and used to fly round the fleet. He was one of the first Naval officers to join the Royal Flying Corps (Naval Wing), and from its earliest days was one of its most able pilots.

THE USUAL STRUGGLE.

In spite of the innumerable occasions on which the efficiency and serviceability of the Blackburn machines had been displayed, Mr. Blackburn had to face a perpetual struggle against odds, on the question of finance, but nothing would induce him to slacken his pursuit of his high ideals. The darkest period, perhaps, as with nearly everybody else in the aircraft industry, was the earlier months of the year 1914, when Government support was being sedulously withheld all round.

Then came, at the end of May, a small order from the War Office for B.E.s, and with great boldness Mr. Blackburn took over the present works at Olympia, Leeds, and formed the present company in June. It is a privately owned concern, of which the chairman is Mr. Stuart A. Hirst, who has always been an enthusiastic supporter of aviation on the sporting side as well as a firm believer in its scientific possibilities. He has been a firm believer in Mr. Blackburn for a long time, and backed him when the public scorned aviation. He is even more enthusiastic to-day.

REAL DEVELOPMENT.

Installed at Olympia, with twenty workmen—a number in sharp contrast with the war-time developments—Mr. Blackburn set to work upon the production of his first biplane, which he designed as a seaplane.

Money was still none too plentiful, however, and he was only able to persevere with his seaplane owing to the kindness of Mr. Kimmins, of the Dobbridge Ironworks, who was manufacturing the 130-h.p. Salmson (Carton-Unné) engine in this country, and provided Mr. Blackburn with one on exceptional terms. The seaplane was intended as a competitor in the "Round Britain" race, and was to have been handled by Mr. Sidney Pickles.

THE OUTBREAK OF WAR.

The advent of the war, however, of course put a new complexion on affairs. Having a spacious site at their command, the Company was prepared for the developments which were soon forthcoming, and Olympia was devoted to seaplane production for the Admiralty. In course of time it became necessary to establish another factory at Brough, right on the side of the Humber, and, of course, the site is eminently suitable for testing purposes, and the construction of large craft.

Like other constructors whose pre-war career was identified with the monoplane alone, Mr. Blackburn has by no means lost faith in that type, and his views are shared by his well-known tester, Mr. W. Rowland Ding. The latter, as a matter of fact, is using daily a monoplane, fitted with a 100-h.p. Anzani motor, for journeying between Leeds and Brough, and goes up with it in any sort of weather. The machine was built as recently as the latter part of last year. The engine, by the way, was transferred from a Blackburn hydro-monoplane which Mr. Ding used for tuition and passenger work on Widemere.

PRACTICAL EXPERIMENTS.

Mr. Blackburn, it may be added, has always been interested in experimental work of all kinds. In 1913 he exhibited at the Olympia Show an automatic stabiliser of his own design. Just before the war he was doing a good deal of practical experimenting with aerial propulsion for barges and shallow draught boats. He made several successful gears, and some were sent abroad, while one has been used with good effect at home.

The slow velocity propeller, giving a speed of six miles an hour only, and all the fittings were designed by Mr. Blackburn himself, and the results achieved lead him to believe that there is a future for aerial propulsion for river work.

Another interesting sideline which Mr. Blackburn produced was a motor sledge for Sir Ernest Shackleton's last South Polar Expedition. In this case, also, the aerial propulsion system was employed. The sledge was fitted with a 35-h.p. three-cylinder Anzani motor, with chain drive to the propeller, and was so designed that when rough ground was encountered the propeller could be disconnected and the power transmitted to rollers as an alternative.

It will be very interesting to learn from Sir Ernest Shackleton whether this machine has or has not solved the problem of the mechanical traction in polar regions, as the motor sleighs which he used in previous expeditions were only partially successful.

The Company's works at Leeds and Brough are to-day organised on the most up-to-date lines and in such a manner as to expedite production. Many shops undertake all the different classes of work, for the aim has been to make the business comprehensive and self-contained. An efficient staff of managers, foremen, and inspectors are engaged; and as Mr. Blackburn sets a practical example by virtually living for his business, a feeling of goodwill and a desire to achieve great things for the firm and for the nation permeates all the employees. Olympia is almost American in its democratic management, and with its valuable aid the name of Blackburn should acquire a world-wide reputation after the war.

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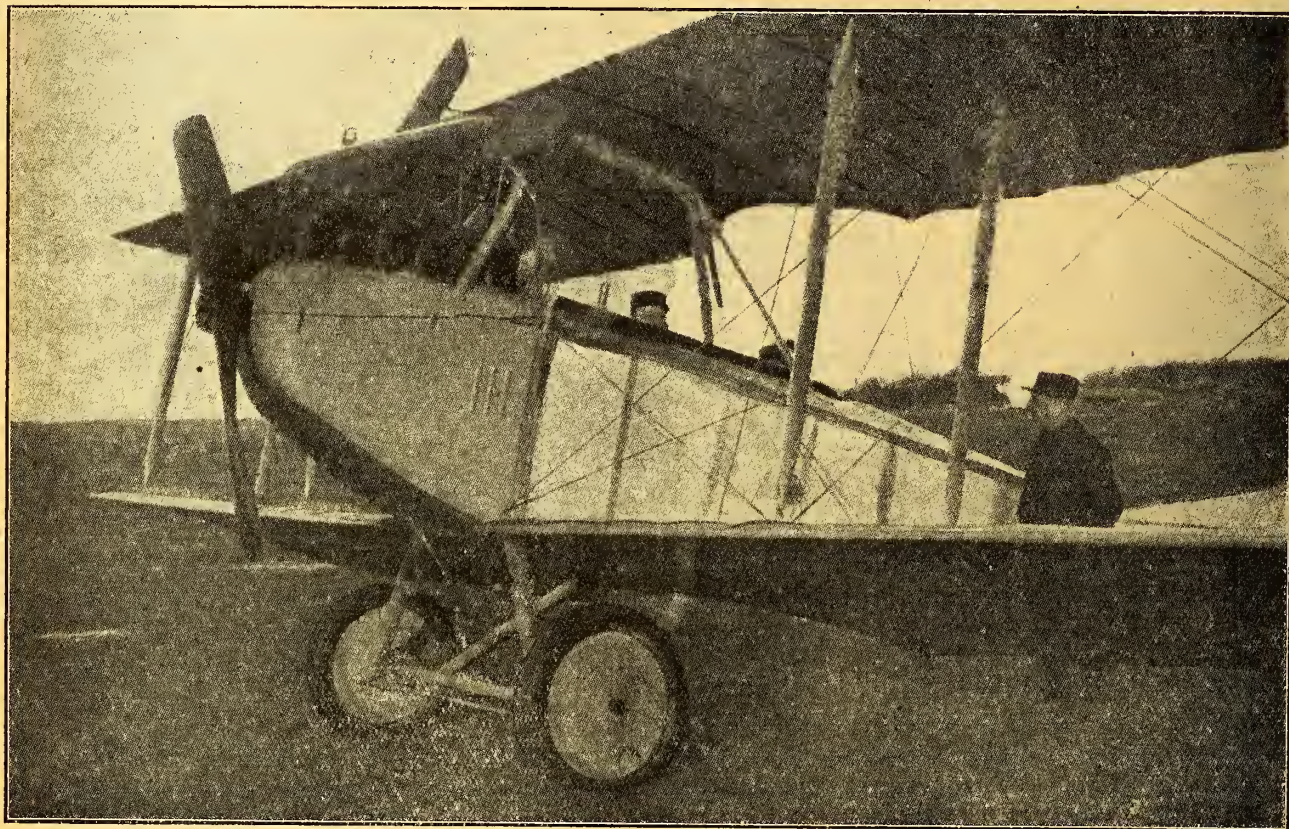
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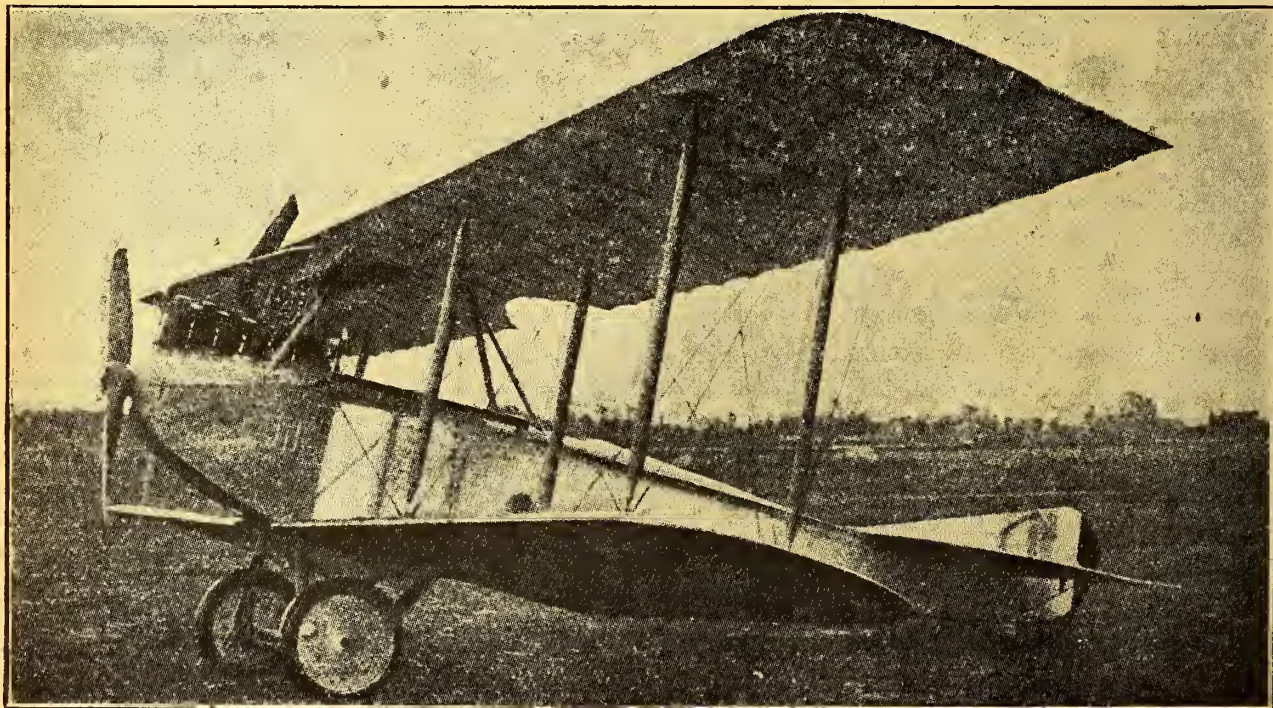
Reproduced from "L'Aérophile," from a French Military Photograph.
The Fore Part of the 1916 type Aviatik.

From an article by M. Jean Lagorgette in "L'Aérophile":—
The present Aviatiks are tractor biplanes with streamline bodies. Their dimensions are practically the same as those of all German biplanes whose evolution they followed. After having a wing-spread almost double the length of the aeroplane, the wings were shortened, while the length of the body remained the same.

WINGS.

The incidence of the wings to the propeller axis is 4.38 deg. throughout their span, and there is no stagger. The planes since 1915 have had only a very slight dihedral, about half a degree.

As seen from above, their shape is practically rectangular, almost forming a parallelogram, for the sweep back is barely



Reproduced from "L'Aérophile," from a French Military Photograph.
General View of the 1916 type "Streamlined" Aviatik.

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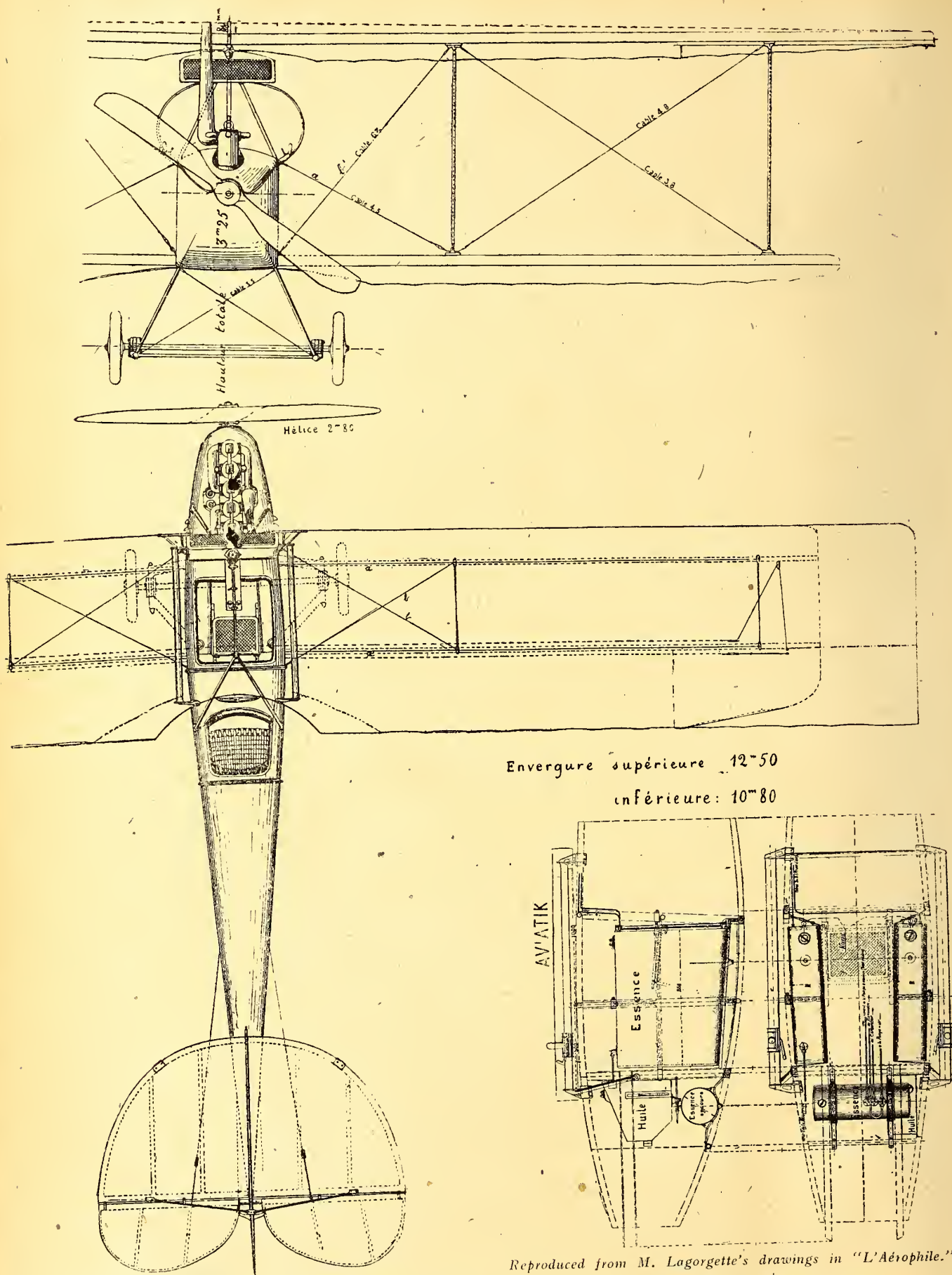
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Reproduced from M. Lagorgette's drawings in "L'Aérophile."

Plan and Front View of the 1916 type "Streamlined" Aviatik. On the right, below, is shown the fore part of the fuselage in plan and elevation, from which the peculiar tank arrangement can be seen. The slight "arrow" or backward sweep of the wings should be noted, as also the rounded tail and elevators, and the pointed nose.

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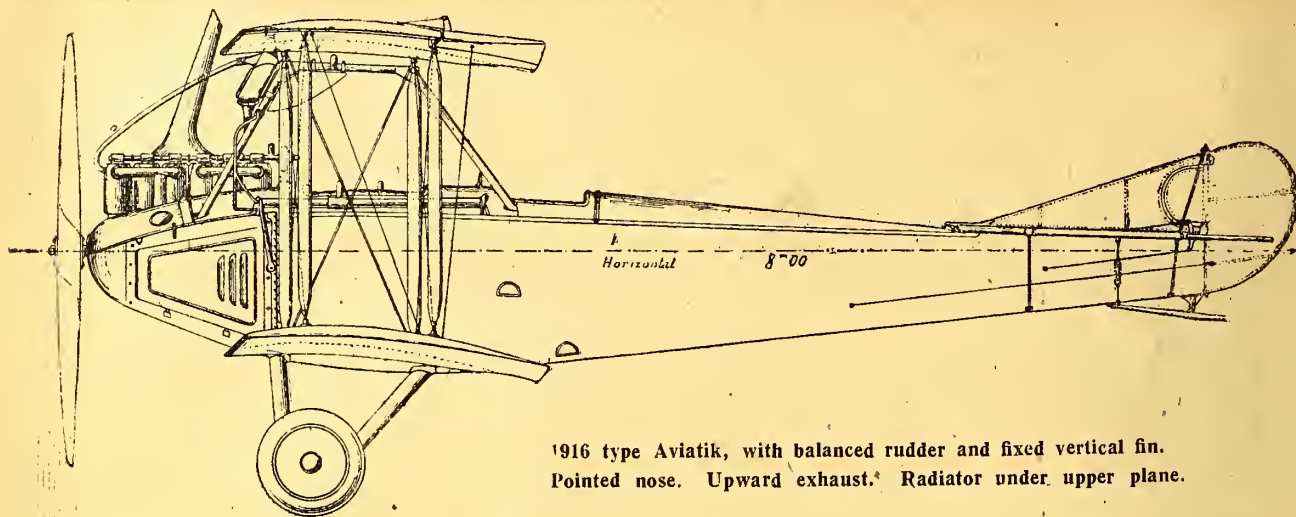
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1916 type Aviatik, with balanced rudder and fixed vertical fin.
Pointed nose. Upward exhaust. Radiator under upper plane.

more than 1 deg. 10 min. On the last captured Aviatik the sweep back has been almost entirely eliminated.

The span of the upper wings is 40 ft. 8.1 in., while that of the lower ones, including the body, is 35 ft. 5 in.

The chord, 6 ft. 1 in., and the gap of 6 ft. 4 in., are slightly greater than in the other German aeroplanes. The total surface of the wings is 430.56 sq. ft., including the surface of the ailerons.

The ailerons are fitted only to the upper planes, and their rear edges rise progressively near the ends of the wings, thus washing out the angle of incidence. Each aileron measures 7 ft. 3.6 in. by 2 ft. 5.1 in., and has an actual surface of 17.22 sq. ft.

Like the wings, they are thicker set and more compact than they formerly were, and though not as extended, are deeper.

TAIL.

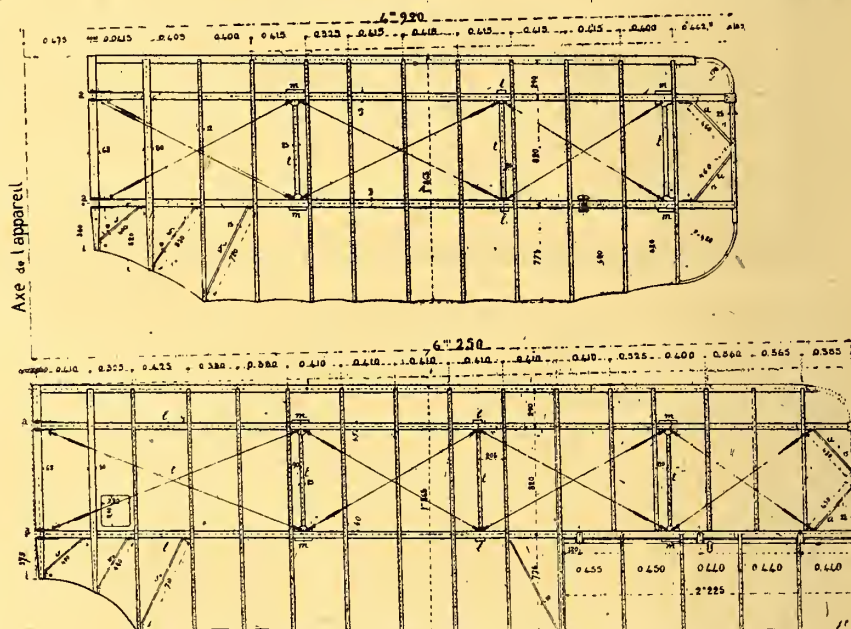
Like all German aeroplanes, the Aviatik has a large fixed tail plane, which measures 4 ft. 10.2 in. by 9 ft. 2.2 in. Its shape, almost a perfect half circle, as in the old monoplane and the first biplanes of the Nieuport firm, has undergone no change since 1913. The tail is a slightly lifting one, and is similar to that of the new Albatros.

Formerly the upper surface of the body upon which rested the tail plane was in line with the axis of the engine, thus making an angle with the said tail. Now the body slopes downward at the rear, but the angle of incidence of the stabiliser is unchanged. Its angle of incidence to the wings is minus 0.58 deg., and the extension of the longitudinal axis passes 5.51 in. beneath the rear edge of the stabilising plane.

The elevator is composed of two semi-oval surfaces between which the rudder is pivoted, as shown in drawing. The dimensions of each surface are 4 ft. 3 in. by 2 ft. 2 in.

The rudder, which was originally shaped like a comma and

without any fixed fin, later, in the 1914-15 type, became semi-circular with a fixed fin. It has now returned to its comma shape, with a slight modification to admit of the fixed fin, which measures 5 ft. 1 in. by 2 ft. 5.5 in., and is balanced.

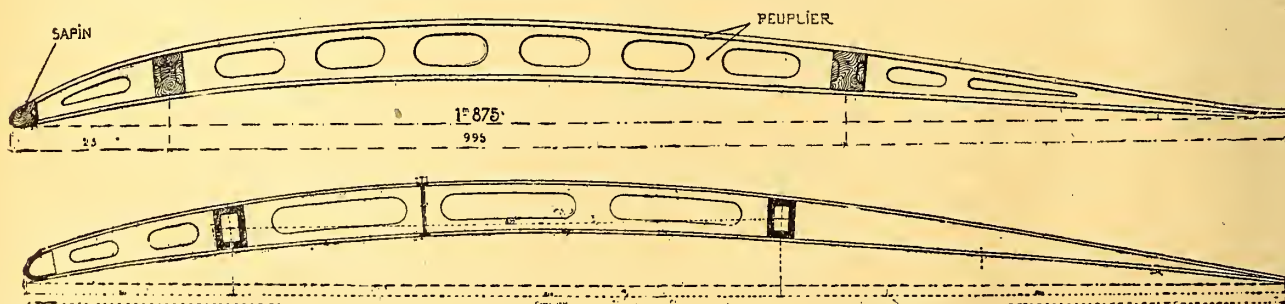


Lower and Upper Wing Design of the 1916 Aviatik.

The dimensions are: Height, 3 ft.; depth, 2 ft. 3.5 in., and the balancing part adds 10.63 in. to the depth.

The surface area of the elevator is 12.07 sq. ft., while the surface area of the fixed tail plane, including the part covering the body, is 35.52 sq. ft.

The surface area of the rudder is 6.45 sq. ft., inclusive of the balancing part, which measures 0.81 sq. ft. in surface area.



Above, wing section of the 1914-15 Aviatik. Spars far apart. Solid from one piece of timber channeled out for lightening.

Smaller and more numerous holes in the ribs.

Below, wing section of 1916 type. Spars closer together. Hollow spars, and long lightening holes in ribs.



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The surface area of the fixed stabilising fin measures 3.23 sq. ft.

The elevator, the rudder and the fixed vertical fin are built up of hollow steel tubing 0.47 in. outside diameter. The edges of the fixed tail plane are of 0.98 in. hollow steel tubing, and its ribs are of wood. The front edges of the elevating surfaces are also of 0.98 in. hollow steel tubing.

The fixed tail plane is fitted to the extreme end of the body, and is not built into the body as it is on the L.V.G. It is supported from below by four small tubes and connected with the fixed fin by two others. The tube constituting the rudder post, outside of the extremity of the body, rests on a sort of cup, as in the Rumpler and the L.V.G.

FUSELAGE.

The length of the fuselage, 11 ft. 6 in., is practically the same as that of the Albatros and the Rumpler. It is built with box girder construction, rectangular in cross section, with diagonal stays of piano-wire. The whole is assembled, as before the war, with collars and couplings, which do away with all necessity of piercing the longerons. These collars consist of a single piece strip of steel wrapped around the longeron and held in place by screws with two ends bent up and held together to take turnbuckles or internal wires. Four other flaps, extending from the flaps on the inside of the longerons and turned up are used for fastening the other cross members.

The body has a good streamline form, more slender than it formerly was. The two lower wings are attached directly to the body on its sides and slightly above its lower edge.

A hollow steel tube running through the body transversely is extended by a steel rod. This rod is passed inside two rings that are part of the metal fitting that envelops the end of the wing spar. A key of elbow shape, but movable from front to rear, locked by a spring, passes through two holes and a hole in end of the rod, and holds the wing securely to the body.

The two upper wings are assembled to one another in a similar manner on vertical tubes supported by the body. There is no open space between them.

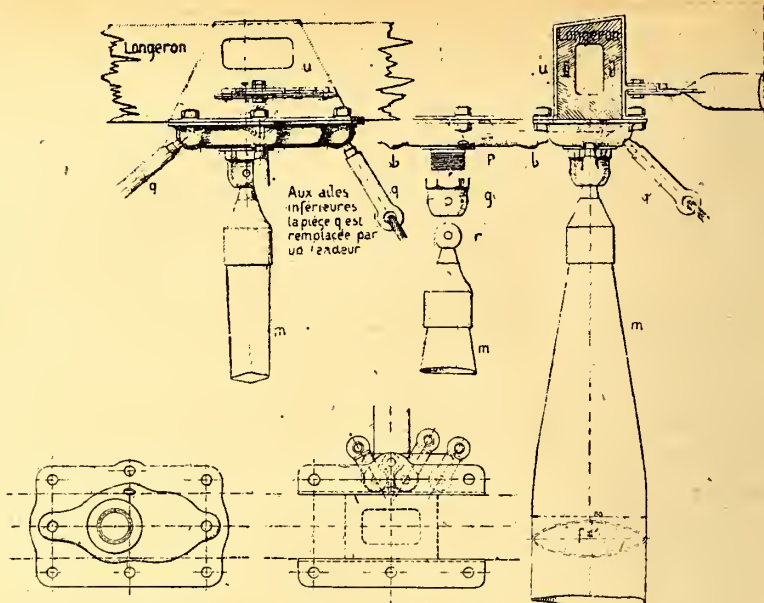
The cockpit is built of steel tubing, with the two rear uprights slanted backward more than formerly, the object being to facilitate the working of the machine-gun, which moves about in the cockpit instead of at the back of it, as in the L.V.G.

The top frame of the cockpit is a round tube, and the four uprights are tubes of elliptic section.

Besides connecting the rudder and elevator with the wings and carrying the landing gear, the body holds the engine in front. A large part of the cylinders project outside of the cowl.

Level with the wings and between the main petrol tank the passenger sits on a folding seat (the two variable weights, passenger and fuel, being rear the centre of gravity, have little influence on longitudinal equilibrium). Although seated well inside the body behind the engine, so that his vision is certainly interfered with, the passenger is rather poorly protected from the wind. The pilot, however, is comfortably seated in a wicker armchair with velvet upholstery. A little rectangular window enables him to see perpendicularly beneath the machine.

The body is made almost wholly of wood. As in all German biplanes, the four main longerons are of ash wrapped with



Fixing of Interplane Struts to Spars in the 1916 Aviatik.

fabric from the front of the machine to the back of the rear seat, and from there on of non-wrapped pine. The joints are bevelled and wrapped.

As in the L.V.G., and contrary to the Rumpler practice, the four longerons of the Aviatik retain their maximum thickness right up to the bow, where the bed for the engine is supported by two cross members, and between these cross members by a thin bracket on either side.

The two upper longerons curve downward sharply at a point level with the pilot's seat, and are narrowed together at a point 3 ft. 3 in. behind the pilot's seat. The uprights and cross members are of pine.

The top of the body is covered with arched plates, which, like those of the cowl, are made of aluminium. The rest of the body is covered with fabric. The floor of the cockpit is made of aluminium plates. There are folding steps inside, none outside.

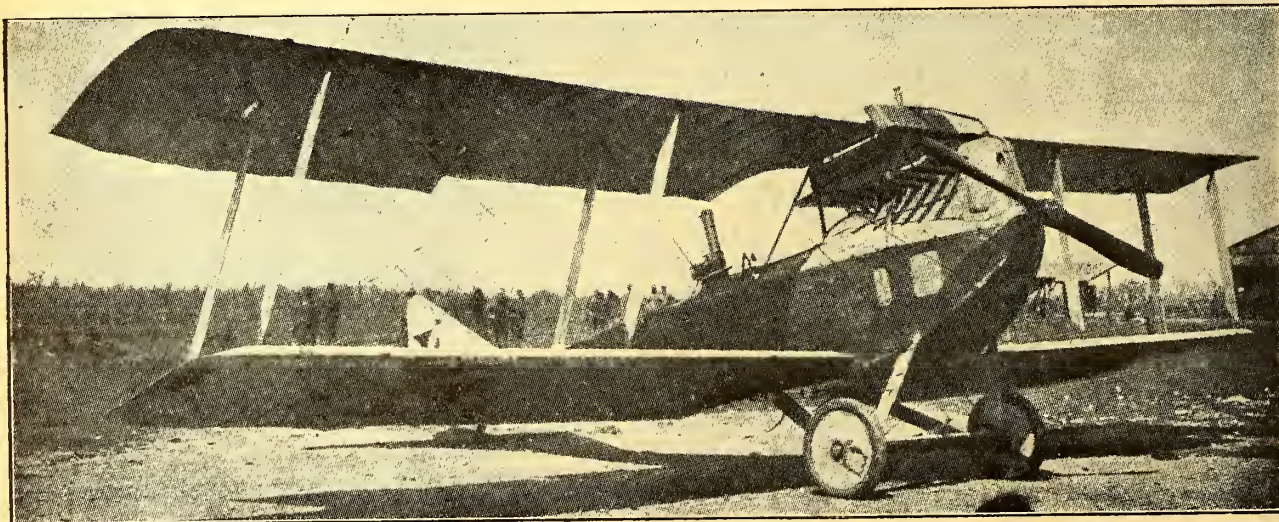
LANDING CARRIAGE.

The landing gear has remained almost identical with that in use prior to the war. It is composed of two Vs of elliptic tubing well spread outward, and with the two supporting members connected at the bottom by a round tube fitted with wooden streamline members.

The landing carriage is held in shape by a cross member of elliptic tubing, horizontal cables and steel cable cross stays.

The axle rests inside of the points of the two Vs, and is elastically attached to the cross section.

On recent Aviatiks, apparently owing to the lack of rubber, the landing gear is different. It has returned to the type usual in France and Germany, but the "Sandow" rubber cords are replaced by three long spiral springs set one inside of the other. ("Abfederungs-Kabel" shock-absorbing cable "taking the place



Reproduced from "La Guerra," the Italian Official Publication.

An Austrian Aviatik biplane with Wurchalowski engine, captured by the Italians. It may be noted that the typical pointed nose of the Aviatik is retained in Austria, but the radiator is raised to accommodate the high engine.

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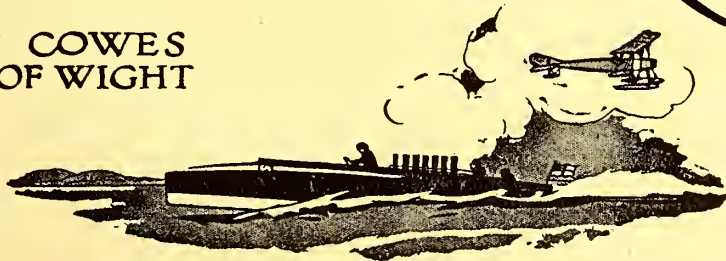
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of rubber.") The track of the wheels remains very broad—6 ft. 2.75 in.

Most of the tubes in the Aviatik, notably the tubes of the landing gear, and of the struts, are internally reinforced with wood. This is not the case with other biplanes.

The tail skid is of the type usually found on German aeroplanes. It is a rod of wood, all outside of the body, hinging on a pivot that is also outside of the body and is held in place by rubber rings that are inside of the body. It is attached underneath a complex piece of metal that encloses the extreme end of the body, and in which is locked and bolted the extremity of the fixed fin.

CONTROLS.

The Aviatik concern has adopted the Deperdussin type of control. The aileron cables pass inside the lower wings, and the rudder is controlled by a foot-bar through cables. The rudder-bar has heel-rests made of metal tubes.

On account of the arrangement of the engine and of the cockpit, and especially because the passenger is seated in the front, the Aviatik does not lend itself, without important changes, to the adoption of the system that has become general on other German aeroplanes, namely, the use of a stationary machine-gun firing through the propeller for the pilot, and another gun on a rear fitting to be used by the passenger.

IMPORTANT FIGURES.

The total weight of the Aviatik of 1916 is the same as that of the L.V.G., and about the same as that of the Rumpler.

Weight of the body (including radiator, tanks, and pipe lines).....	757 lbs.	
Weight of the wings	308 lbs.	
" struts	28 lbs.	
" propeller	42 lbs.	
" engine	673 lbs.	
" cooling water	55 lbs.	
Total weight empty	1,863 lbs.	
Weight of fuel	418 lbs.	
Useful weight: pilot, passenger, armament, accessories, etc.	550 lbs.	
Total load	968 lbs.	
Total	2,831 lbs.	
Weight per sq ft. of sustaining surface	6.81 lbs.	

	Test	From
Speeds	in France	German source.
Maximum speed at sea-level	82 m.p.h.	
Minimum speed at sea-level	49 m.p.h.	
Speed at 1,000 metres	79 m.p.h.	83 m.p.h.
Speed at 2,000 metres	74.5 m.p.h.	80.7 m.p.h.
Speed at 3,000 metres	66 m.p.h.	
Climb to height of 500 metres.....	4 min. 30 sec.	
Climb to height of 1,000 metres.....	9 min. 30 sec.	
Climb to height of 2,000 metres.....	21 min. 30 sec.	
Climb to height of 3,000 metres.....	47 min. 30 sec.	

Supplies carried for 4 hours and 30 minutes' flight.

The "ceiling" of the machine is at 3,500 metres, or nearly 11,500 ft., with a useful load of 720 lbs. German pilots have, however, affirmed that they have climbed as high as 15,750 ft. with their observer and 18.5 gallons of petrol.

Aviatiks with Benz and Mercedes motors of 220 h.p., differing from the 170 h.p. in cylinder bore only, are said to be in building, with two machine-guns, one of which will fire through the propeller. They are expected to have a speed of 93 miles per hour at a height of 2,000 metres.

The present type is handy; the working of its rudder and elevator is fairly good, and its motor is strong and flexible.

BALLOON CONSTRUCTION.

One of the few consolations of the present war is that it has created opportunities in many spheres for those who have worked diligently along various lines of research, involving the expenditure of years of time and no inconsiderable sums of ill-spaced money, to earn some compensation for past sacrifices.

Love of experimental investigation cannot be said to be a common British trait, but where the instinct for investigation does exist among British people, it is usually very deeply rooted, and once an Englishman has made up his mind to delve into an unsolved problem it takes a lot to throw him off the scent.

It is doubtful whether scientific investigation has anywhere been pursued under more difficult conditions than in aeronautics, because the claims of its disciples were so extremely revolutionary and in the mind of the many diametrically opposed to all natural law, and from the oldest days until the war nothing was more

difficult than to persuade the public to put up money for any enterprise connected with aerostation and aviation.

The many financial difficulties in the way of aerostation make it almost incredible that a firm solely devoted to this work could exist for years, but it is none the less true.

The oldest firm of aeronautic engineers in this country is C. G. Spencer and Sons, Ltd., the foundation having been laid in 1835 by the late Mr. Edward Spencer, the friend and colleague of Charles Green, the famous scientific balloonist.

His son, Charles Green Spencer, grandfather of the present managing director of the firm, took an active part in the business. For many years the activities of the firm were confined to the making of balloons and parachutes and to the organisation of balloon ascents and parachute drops. Much of the work undertaken was of a truly scientific nature, but the carrying out of exhibition work of an acrobatic nature was necessary to keep the firm supplied with funds.

As soon as the development of light engines gave sufficient encouragement, the firm devoted its attention to the question of the airship, and in 1901 produced a small vessel which, considering the limitations of its envelope and power-plant, was not unsuccessful, and flew from the Crystal Palace and round St. Paul's cathedral.

A more successful airship was built in 1910, which was fitted with a Green engine, and piloted by Mr. Henry Spencer and the late Mr. (afterwards Major) F. W. Goodden made a number of flights from Longton, Staffs.

Another small airship was built in 1913 for the Bovril firm to advertise their beverage, and at the period this small ship was seen over London and elsewhere on various occasions, 16 ascents in all being made.

Some knowledge of the early history of the firm of C. G. Spencer and Sons, Ltd., makes one the more pleased to observe the prosperity it now enjoys after so many years' hard work. The original factory at Highbury has been supplemented by various buildings in North London, which are now devoted chiefly to the manufacture of kite balloons of the latest types, although in the past most successful work has been done with envelopes for airships and other work of a similar nature. Many parachutes also are constructed for the Royal Naval Air Service and the Royal Flying Corps.

The construction of a kite balloon is a much more elaborate business than one might imagine, and the number of hands employed upon the manufacture of one balloon is quite remarkable. A visit to the various works now established by the firm is quite an object lesson in organisation and system, which has had the happy result of permitting the firm to claim the largest output of kite balloons in this country.

The manufacture of a kite balloon has its genesis in a series of the ubiquitous blue prints common to aeroplane construction, and all other engineering. From these blue prints are manufactured templates to correspond with the numerous sections of the envelope. From these templates the rubberised balloon cloth is marked out, and cut out by an electric cutter, 30 sets at a time. The various sections are then sorted out and numbered according to their relation in the balloon and are stitched up into strips on special sewing-machines. Each seam, in the stitching, is covered inside and out by strips of rubber and tape, which are attached by small girls, who plaster on special solution of a particularly sticky nature, which looks for all the world like raspberry jam without the pips. When the sticking of the strips is finally completed they are taken to what may be called the erecting shop to be built up into a complete balloon envelope. The impression which suggests itself to the mind of a stranger on entering this shop, which is a building of sufficient size to lay the whole balloon envelope right out, is that of the stage of a variety theatre about 15 seconds before the curtain is due to go up. This impression is created by the spectacle of the enormous parti-coloured balloon envelope stretched right out across the floor, upon which a score or two of nymphs, from the ages of 14 to 19, recline in all sorts of graceful and ungraceful attitudes all over it, busy attaching tapes and other oddments which help to make the complete balloon. The theatrical aspect of the operation is added to by the number of fatherly old seamen who are employed on the rope-splicing and rigging, who seem to have arrived *en masse* from Sunwich Port, or some other haven whence all good seamen come.

When finally a balloon is complete and "ready for the post," it is inflated with air in a real airship shed, upon the canvas of which one finds the imprint of Maréchal and Hervieu, where it is inflated and passed by the official inspectors.

After which, it is packed up into a bundle approximately the size of a very large hassock all ready for delivery to the required depot.

As regards the present generation of the Spencer family, the five brothers have made ascents and parachute descents all over the world, and in some of the most unexpected places. The two elder brothers, Percival and Stanley, are dead. Messrs. Sydney and Henry Spencer are now not actively interested in the firm, which is managed by Mr. Arthur C. Spencer, who has as co-directors his wife and Mr. Ernest Allen. The works' manager and chief draughtsman is Mr. Ernest G. Cole. The post-war activities of the concern will be watched with interest.—W. L. W.

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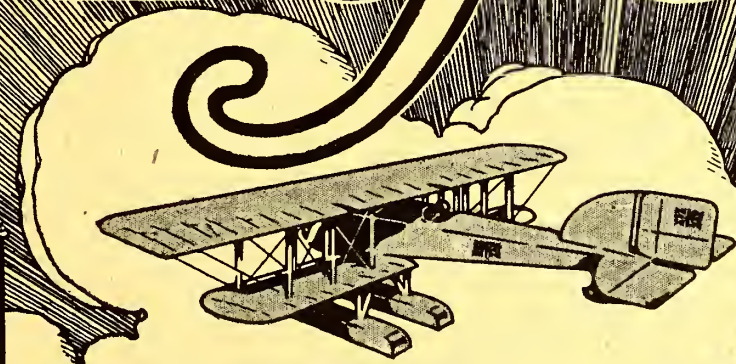
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AIRCRAFT

A "BLIMP" SPECIFICATION.

On Feb. 26th the United States Navy Department sent out requests for bids on dirigible balloons. These bids were sent out by the Bureau of Steam Engineering and the Bureau of Construction and Repair, jointly, and constructors were asked to state the price for one, two, four, eight and more dirigibles. Bidders could enter bids for dirigibles separate from the power plants. If such proposals were submitted the dirigibles were to include the gas bag and all that goes with it, while the power plant was to include the engine, fuel tanks, airplane body, etc.

"Aviation and Aeronautical Engineering" (New York) of Mar. 1st published the following condensation of the proposals sent out by the Navy Department:—

THE CONSTRUCTION OF A NONRIGID DIRIGIBLE.

This specification contemplates a nonrigid self-propelled dirigible for use in connection with coast or harbour patrol. It is intended that it shall be operated from a base on shore, but that it shall be possible for it to rest upon the surface of the water in good weather. The airship shall consist of a nonrigid envelope made of rubberised fabric and containing hydrogen under sufficient pressure to maintain the rigidity of the envelope. There shall be attached to the envelope vertical and horizontal fins and vertical and horizontal rudders, mooring line, rip panels, manoeuvring and safety valves, ballonets or internal air sacks with means for their inflation. Beneath the envelope and supported thereby is carried upon a suspension a car or body containing the power plant, fuel, ballast, personnel, radio, etc.

The envelope fully inflated has a displacement of about 77,000 cubic feet, corresponding to a gross buoyancy of 5,275 lbs. when inflated with hydrogen of good commercial purity and under normal conditions of barometer and temperature.

The length of the envelope is 160 feet and the maximum diameter 31.5 feet; maximum width over tail fins, 36.2 feet; the centre of buoyancy is 69.2 feet from the nose; the height over all is 50 feet; horsepower of motor, 100; horsepower of blower engine, 2; maximum safe altitude, 7,500 feet. Designed maximum speed at an altitude of 600 feet, 45 miles per hour; endurance at full power, 10 hours; cruising speed, 35 miles per hour; endurance at cruising speed, 16 hours. Capacity of tanks, 100 gallons, 600 lbs. Total volume of both ballonets, 19,250 cubic feet. Reserve ballast tank in car, 300 lbs. of water. Trimming tanks attached to envelope: Forward, 40 lbs. of water; after, 50 lbs. of water.

A plan is furnished as a part of the specifications. In case of any discrepancy between the plan and specifications, however, the specifications shall prevail. The workmanship throughout shall be of the most thorough character and suitable for the purpose intended and satisfactory to the inspectors. Aluminium shall not be used for important strength members, nor shall any strength member depend for its strength upon brazing, welding, or soldering.

WEIGHT STATEMENT.

	lbs.
Envelope	1,177
Gas valves and sight holes	36
Air ducts, valves, and manifold	54
Suspension	35
Ballonets	350
Fins and rudders	480
Running rigging	43
Car :	
Structure (including tank weights)	321
Engine, complete	568
Blower engine and blower	100
Starting crank for main engine	25
Lighting cells, wiring and lamps	30
Landing gear and floats	58
Miscellaneous fittings	57

Total "penalty weight" ... 3,334

Useful load :

Pilot and observer	320
Instruments	100
Radio	250
Fuel and oil	670
Water ballast (including trimming)	390
Sandbag ballast	211

1,941

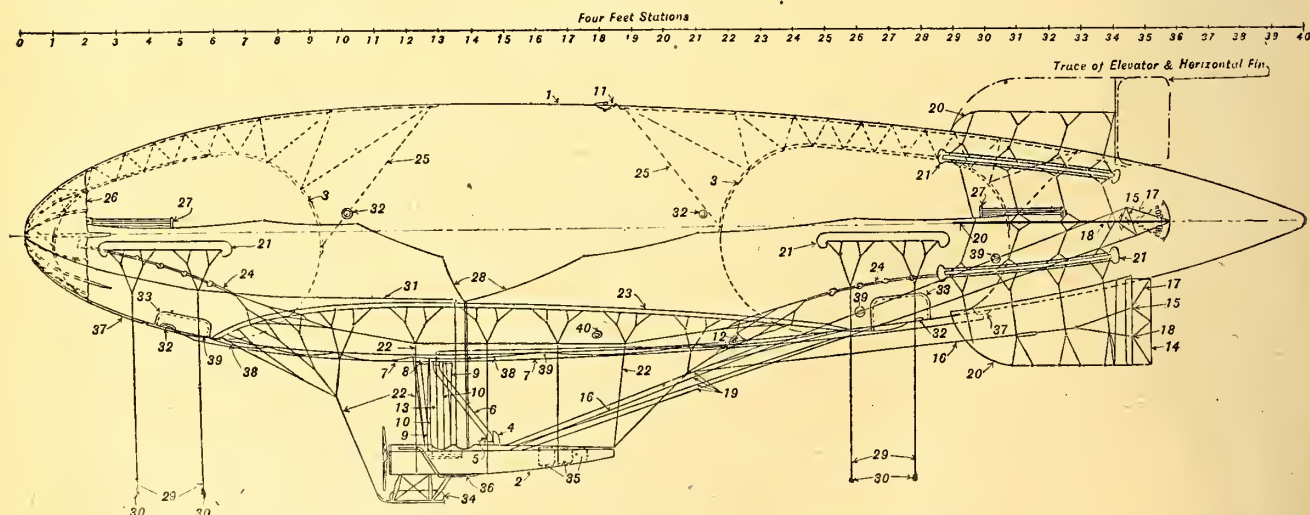
ARTICLES OF EQUIPMENT.

Tachometer, gasoline air pressure gauge, circulating water and lubricating oil, thermometers, oil-pressure gauge, longitudinal inclinometer, map boards, mooring rope, two gas pressure manometers, one ballonet air pressure manometer, altimeter, statoscope, compass, air speed meter, fire extinguisher (chemical sprinkler type). Search light.

FABRIC REQUIREMENTS.

The contractor must show that the fabric factor of safety under normal running conditions for any part of the dirigible exceeds 8. The strength to be taken as a basis, to be found by the methods given below.

All fabric used in the envelope or ballonets to contain two or more plies of cloth, one of which is to be laid on a bias of 45 degrees. Sufficient rubber of proper quality shall be placed in the fabric to meet the requirements as to diffusion and weather-resisting properties, which are given below. The protective coating on the outside of the envelope shall be at least 0.4 ounce per square yard, and on the inside 0.2 ounce per square yard. No fabric in the balloon is to weigh over 12 ounces per square yard, and no fabric is to test less than 40 lbs. per inch in the direction of any of the threads, either bias or straight, test to



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- | | | | |
|---|-------------------------------------|-------------------------|-------------------------------------|
| 1. Gas Envelope | 11. Valve, Pressure Relief | 21. Doubling Patch | 32. Sight Holes |
| 2. Car | 12. Valve Manoeuvre Gas | 22. Car Suspension | 33. Patch for Removing Ballonet |
| 3. Ballonet | 13. Operating Cord, Manoeuvre Valve | 23. Belly Band | 34. Kapok Floats |
| 4. Blower Intake Pipe | 14. Rudder—Twin | 24. Webbing | 35. Fuel Tanks |
| 5. Engine for Blower | 15. King Post | 25. Ballonet Suspension | 36. Muffler |
| 6. Main Air Discharge Pipe | 16. Leads, Steering Gear | 26. Nose Reinforcement | 37. Trimming Tanks |
| 7. Air Pipe to Ballonet | 17. Bracing Wire | 27. Rip Panel | 38. Operating Cords, Trimming Tanks |
| 8. Air Manifold | 18. Elevator | 28. Rip Cord | 39. Guides for Operating Cords |
| 9. Operation Cord, Ballonet Exhaust Valve | 19. Leads for Elevator | 29. Grab Ropes | 40. Filling Hole and Doubling Patch |
| 10. Operation Cord, Butterfly Valve | 20. Fins, Stabilising | 30. Weights | |
| | | 31. Mooring Rope | |


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be made as described below: Fabric in the top of the balloon shall show an average strength over 60 lbs. per inch for the four different directions of threads; or a strength over 100 lbs. per inch in either warp or filler if the two plies are doubled straight together for a sample test.

MODEL TEST.

Each contractor for one or more dirigibles shall construct a model of linear dimensions one-thirtieth the size of the balloon, made of identical fabric, provided with suitable suspension disposed in similar fashion to that on the full-size balloon. This model to be inflated (upside down) with water to correspond with the full-size balloon when inflated to five times its normal running pressure. This will mean on the model a head of water at the top equal to $1\frac{1}{2}$ feet. Leave pressure on for ten minutes.

TESTS ON COMPLETED ENVELOPES.

Each envelope when completed shall be blown partially full of air and all fabric inspected from the inside against a light to detect small leaks. After inflation with hydrogen at normal operating pressure, the envelope must show a leakage of gas less than 1 per cent. per day, with all valves and accessories in place. Envelope, with ballonets in place, after inflation with hydrogen shall be inflated to a pressure of 3 inches of water at lowest point and held there for one minute. This is three times the normal pressure for flight, but no defects shall be developed by this proof test.

MOORING EYE.

The nose shall be reinforced by a doubling patch of fabric similar to that in the envelope and wood battens about $\frac{3}{8}$ inch by 3 inches in section equally spaced, converging at the nose, every alternate batten to extend beyond the doubling 3 feet. An eye shall be provided in the nose for a mooring line. This eye will consist of a $1\frac{1}{2}$ -inch metal thimble secured in an eye splice of a four-strand manila rope. The rope will be unlaid and the eight strands let in beneath the doubling patch, equally disposed radially, the ends of the strands frayed and the whole set in cement. The breaking strength of the mooring attachment shall be about 5,000 lbs.

Rip panels, four in number, shall be located as shown with a rip cord, dyed red, run from each through light agate guides to the pilot. By pulling the rip cord weak stops securing the end of the panel are to break and tear open the panels for rapid deflation in an emergency.

Grab ropes, eight in number, shall be secured to patches on envelopes. These to be $1\frac{1}{2}$ -inch circumference manila rope secured to crows'-feet of $\frac{3}{4}$ -inch flax signal halyard stuff (braided of 3-ply thread in 8 strands of flax twine; breaking strength, 800 lbs.).

Ballonets are located as shown. Their combined volume is 25 per cent. of the total volume of the envelope. The relative sizes of ballonets are to be adjusted so that their displacements give equal moments about the centre of buoyancy of the envelope when completely inflated. The ballonets are to be fitted with a suspension band of fabric running around the plane of symmetry to which a light flax suspension is to be attached. Sight holes of transparent material are to be placed in the envelope for inspection of this suspension.

The lower part of the ballonet to be secured to a patch of doubled envelope fabric sewed and cemented to the envelope. This patch when removed carries with it the ballonet and windpipe connection. A sight hole shall be located in the ballonet patch for inspection of inside of ballonet. The safety valve will be located on top of the envelope. Construction of the valve is shown on detail sheet. This valve is to automatically open outwards when pressure in envelope at lowest point exceeds 1 inch of water. The manœuvre valve will be located under the envelope and will operate as a safety valve also, but may be opened by means of a line to pilot's seat. These valves are to be tested for tightness of seat and the spring loading adjusted as stated on the detail plan before installation. The belly band or suspension band is to be a heavy fold of canvas running round the lower part of the envelope, bearing at intervals hardwood toggles for the crows'-feet of the car suspension. This band shall be securely sewed and cemented to the envelope in a manner which on test is shown to develop the full strength of the latter fabric.

FINS.

Stability of route is assisted by two horizontal fins and three vertical fins as shown. These fins are to be 170 square feet in area each, except the vertical fins shown on top of the envelope, which will be 80 square feet area, and are to be made up of a light structure of steel tubing and wood with internal wire bracing and covered with airplane linen treated with five coats of dope and varnished to give a smooth, taut surface. The fins to be braced by wires with turnbuckles, and crows'-feet to doublings on the envelope. Weight of fins to be kept down to one-half pound per square foot. Doubling patches shall be fitted on envelope to secure butt edges of fins by lacing.

RUDDERS.

Two horizontal rudders, each 70 sq. ft. area, and two vertical rudders, each 35 sq. ft. area, are to be provided. Both the

horizontal and vertical rudders are to be balanced and to work in ball bearings. Rudders to be securely trussed and operated by non-conducting leads (flexible cable of flax line) passing through agate guide rings, or ball bearing bronze sheaves as indicated on the plans. Rudder operating leads to give the least number of turns to reduce friction to a minimum. Fins and rudders to be readily detachable.

The car is to be electrically insulated from the envelope, and no valve or other operating leads shall be of continuous wire. All metal parts in car are to be electrically connected. Metal parts of valves and their seats, wherever located, shall be electrically connected.

STEERING CONTROLS.

All steering controls shall be in duplicate and interconnected.

Tanks shall be provided and arranged substantially as shown on general arrangement plan, sufficient for a 10-hour supply of fuel and oil at full power for the engine. The main fuel tanks shall be interconnected and so arranged that fuel may be taken from any tank or combination of tanks. Valves shall be operated from the rear seat and shall be quick acting. Fuel tanks shall be of noncorrosive material. If copper tanks are used, they shall be tinned on the inside. Tanks shall, before installation, be tested to an internal pressure of 5 lbs. per square inch and must show no permanent deformation.

The water-ballast tank shall be located in the body and be of 300 lbs. capacity, and provided with means for rapid discharge from the pilot's seat. The tank is to be made of water-proof fabric and shall be tight when full.

In addition to trimming the dirigible by manipulation of horizontal rudders or shifting air between ballonets, small water containers are to be placed near the bow and stern of the envelope, fitted with spring loaded valves, and means whereby such valves may be pulled open by the pilot. The forward tank shall contain 40 lbs. of water and the after tank 50 lbs. of water, and these tanks shall be located at the point shown in the general arrangement plan. The forward tank should be a fabric tube laced along a meridian with a valve in its lower after end. The after tank shall be as flat as possible and secured in a fabric pocket under the envelope and between the lower vertical fins.

BLOWER SYSTEM.

A 2 h.p. 900 revolutions per minute engine of motor cycle type is to be arranged to drive through a 2 to 1 gearing a multi-vane blower of a capacity of 600 cubic feet per minute against a head of 2 inches of water. A crank is to be provided for starting the motor, which is to be accessible from the rear seat. Precautions similar to those stipulated for the main engine shall be provided for the blower engine to prevent flame from back fire or exhaust.

The radio outfit ("wireless") will be supplied by the Government.

CAR.

The car or body is of standard aeroplane type, consisting of a rigid rectangular girder of spruce trussed with wire. The engine and radiator to be mounted forward, with a sheet steel fire bulkhead behind them; next the pilot with all controls and instruments; next the observer with duplicate controls and radio key; next the blower and radio outfit; next a fabric tank for water ballast; and last the gasoline tanks for 10 hours at full power. Reserve oil and gravity gasoline tanks may be mounted near the engine as shown on the plans. The car is to be enclosed with aeroplane linen except over the engine, where the covering shall be of sheet aluminium. The engine compartment shall be well ventilated and the bottom perforated to prevent accumulation of gasoline in case of leakage.

The department will supply and the contractor install a sprinkler type of chemical fire extinguisher with nozzles located near carburettor.

The negative buoyancy of the ship on landing will be carried by skids of ash, to which are securely strapped, as shown, waterproof fabric cylinders stuffed with kapok fibre. The cockpits shall be of convenient size, seats and rims well upholstered, and arranged to ensure the comfort and convenience of the pilot and observer.

The pilot who is in the forward seat shall have all necessary and specified instruments and means for control of the ship. In particular his instrument board shall include two independent and different means for measuring the pressure of hydrogen in the envelope. The car shall have a jackstay along top and stirrups under bottom, as shown, to enable a man to reach engine or gasoline tanks in the air. The maximum propeller diameter permissible is 8 feet 6 inches.

SUSPENSION.

The car is to be suspended from the envelope by means of galvanised-wire cables with breaking strength of 2,700 lbs., arranged as shown. The cables are to be fitted with means for adjusting their lengths to equalise the load. The cables are connected to the suspension band by crows'-feet of braided flax, $\frac{3}{4}$ -inch signal halyard stuff, as specified elsewhere. To carry the car when the dirigible is inclined the upper ends of suspension cables are connected by a fore and aft stay as shown.

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The suspension cables shall be connected to the car by hooks or bolts arranged to permit ready detachment.

POWER PLANT.

Includes engine, propeller, radiator, starting device, gasoline and oil tanks, piping, controls, gasoline oil gauges, pressure gauges, thermometer, power-transmission system, tachometer, necessary shipping crates, etc., in order for flight, and as per the following specifications:

The engine shall be a standard Curtiss OXX-3, 100 h.p. aviation engine, or a Hall-Scott A-7-A, 100 h.p. aviation engine. The engine shall be provided with an effective starting device, so fitted and installed that engine may be easily started from the front seat. If hand starting is used, a booster coil will be provided.

ENGINE TESTS.

Each engine shall, before shipment from the factory, be subjected to a one-hour full-power run on propeller.

With each dirigible the contractor shall deliver the following:

One ground cloth, 170 by 35 feet, 100 sand bags holding about 40 lbs. of sand each, 1 filling balloon or service gas reservoir of 700 cubic feet capacity, 5 screw stakes, 1 extra mooring rope, 200 feet filling tube, 6 inches in diameter, with connecting sleeve, 1 roll of each weight of fabric used, 1 fabric stitcher, 1 fabric roller, 5 gallons of cement, 100 feet of each size of wire or cable used, 100 feet of each size of rope used, 1 spare gas safety valve, complete, 1 spare gas pressure manometer, 1 set of each size bolts, sheaves, guides, shackles, thimbles, turnbuckles, toggles, or other miscellaneous fittings used—list to be approved by the naval inspector.

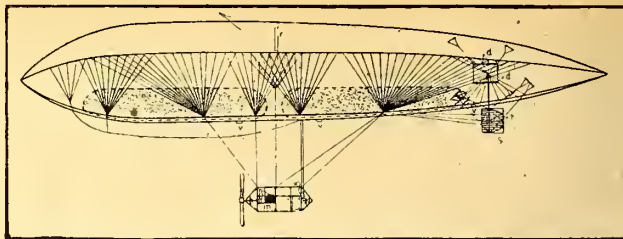
FRANCE AND AIRSHIPS.

Judging from the photograph reproduced herewith from the French paper, "La Guerre Aérienne," the French army has not abandoned its airships. As a matter of fact, French official communiqués occasionally refer to the bombardment of enemy positions by airship.

The photograph shows an airship of the "Astra-Torres" type, with an envelope of trefoil section. The most novel feature is the use of two cars instead of one, each car containing a portion of the crew and an engine of 250 h.p.

The thick cylinders which can be seen between the cars and the envelope are air pipes leading to air ballonets, which keep the airship fully distended.

The air-screws are situated behind the cars, and apparently arrangements are made whereby the air pressure, set up by the motion of the airship, is used to inflate the ballonets. It is not yet permissible to explain how the non-rigid airship thus stiffened can take up the great strains which two separate cars must impose upon it. It would seem that any considerable re-



A Diagram of the Astra-Torres Airship in the small and early type.

duction in pressure would result in a serious contortion of the airship, but apparently the system is sufficiently successful.

The system of suspensions employed in the "Astra-Torres" type is not very generally understood. All the cables are taken from the two points in the trefoil section of the envelope where the three lobes intersect. This naturally means that the cables have to pass through the bottom lobes on the way to the cars. The places where the cables pierce the envelope are naturally suitably reinforced.

The advantages to be derived from the Astra-Torres principle relate chiefly to the angle at which the cables may be attached and the high point of attachment.

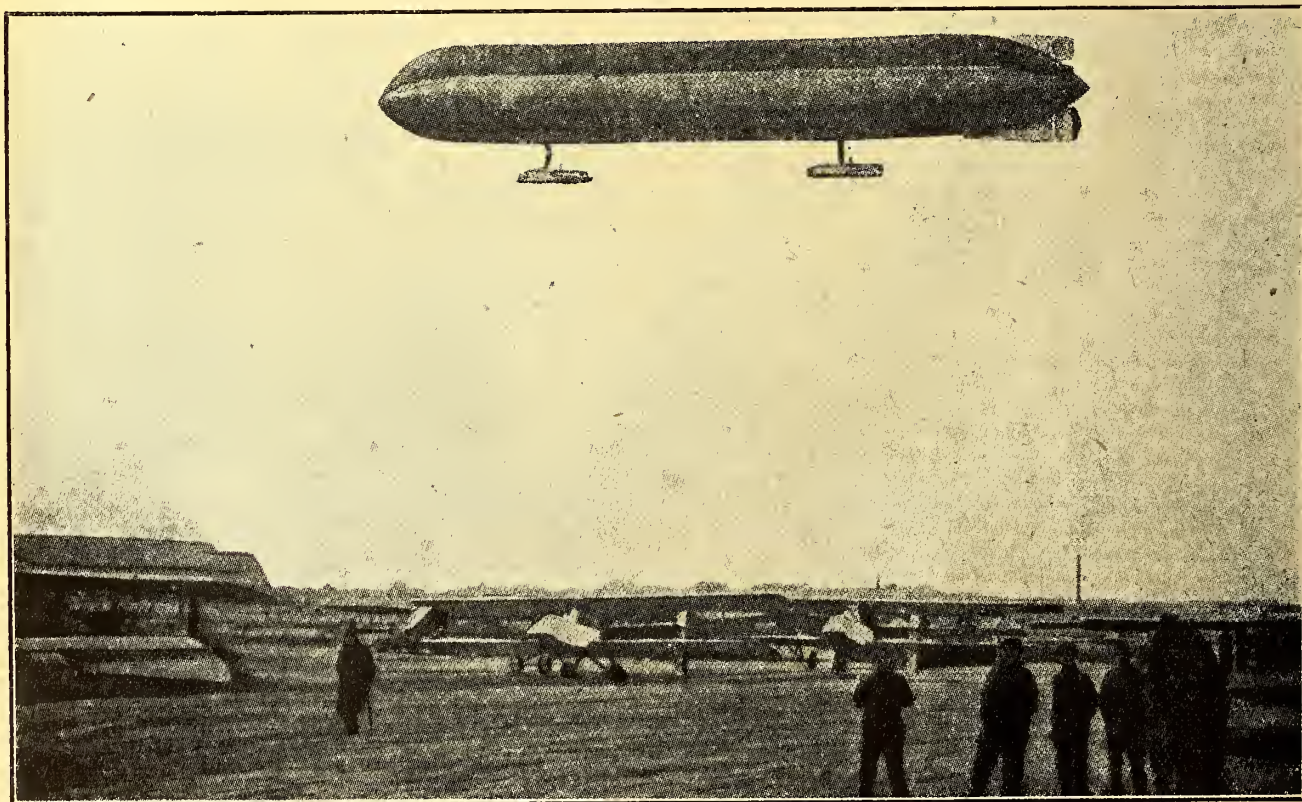
In the more common type of airship with a hull of circular cross section, the point of suspension is necessarily at or below the greatest diameter of the hull, which besides bringing the cables far out of the perpendicular, also brings them very low down the envelope, as it is necessary for the cables to clear the envelope on the way down, which means that the car has to be suspended at a greater distance below the envelope than would otherwise be the case, with a resultant increase of head resistance.

The line drawing gives some idea of the system of suspension applied in the earlier Astra-Torres airships, which only had one car. Apparently the same general system remains in the double-car ships with necessary counter-bracing between the two cars.

The steering gear of the airship may easily be distinguished in the picture, and consists of fixed horizontal and vertical fins, to which are attached hinged rudders and elevators.

The non-rigid airship seems to have superseded the semi-rigid type very generally, at any rate so far as airships are concerned of which it is permissible to speak. This seems to indicate that the problem of ensuring the rigidity of the envelope by internal pressure has been really satisfactorily solved.

Naturally the semi-rigid airship with a rigid keel is far better qualified to retain its contour than the non-rigid in the event of the escape of gas. Where the non-rigid scores is in the absence of a long, heavy, rigid keel which has no aerostatic qualities.



Reproduced from "La Guerre Aérienne."

A Dual-Car French Airship, of the Astra-Torres Type.



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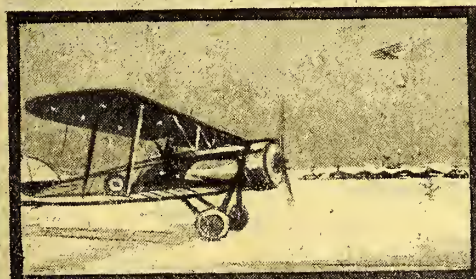
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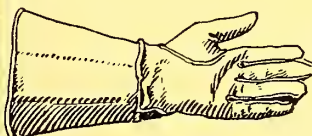
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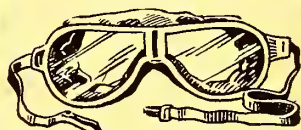
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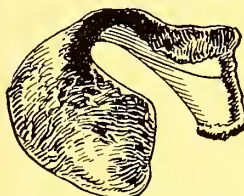
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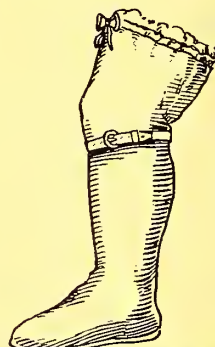
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A paper was read by Mr. A. P. Young, A.M.I.E.E., A.I.A.E., on April 4th, on "The High-Tension Magneto, with special reference to the Ignition of Aeroplane Engines."

The paper was of great interest, but of immense length, so that unfortunately it is only possible to publish extracts. Mr. Young said:—

The degree of success achieved in the development of the combustion motor has at all stages been primarily dependent upon the efficiency of the ignition system used, and it is no exaggeration to say that the rapid strides which have, during the last decade, been made in the construction of the petrol motor, *per se*, have mainly resulted from the very satisfactory high-tension ignition system that has been available. It is fundamentally true—although perhaps a mere commonplace—to say that the most perfect engine mechanism is of little use if the ignition system be faulty.

During the last two decades we have witnessed the birth and subsequent healthy development of high-tension ignition in the form of the magneto, and the wonderful efficiency of this system, coupled with its extreme flexibility—enabling one magneto to cope with almost any number of cylinders—is primarily responsible for the enormous developments that have taken place in the application of the petrol motor to industrial and—in more recent times—war purposes. Without the high-tension magneto it is certain that the aeroplane would never have reached its present high state of development.

Prior to the outbreak of war the number of high-tension magnetos being produced in this country formed a negligible proportion of the total number being used for a variety of purposes. Through laxity on our part this most vital "key" industry was allowed to develop in Germany, but one is happy to know that the war has taught us a lesson in this respect and that our motto as a nation in the future will be "never again." During the period of the war the magneto industry in this country has developed at a really wonderful rate, and all those participating are to be congratulated—and indeed the country is indebted to them—on the present healthy and hopeful state of the industry.

You can judge what has been done when I state that the British Ignition Apparatus Association—which has been formed mainly as a result of the efforts of Mr. P. F. Bennett, the chairman, and Mr. E. Garton, the secretary—is at the moment supported by ten British magneto manufacturers, who have, during the period of the war, supplied to the Government for war purposes, and chiefly for aeroplanes, no less than 200,000 magnetos. Furthermore, I think it is agreed by those in a position to judge that the British magneto as at present constructed is the equal of the pre-war Bosch magneto emanating from Stuttgart, which is sufficient testimony that the British manufacturers have done their duty. I can go further and state from first-hand knowledge that certain developments now taking place will result in the British manufacturers producing new types of magneto that will prove to be vastly superior to anything turned out of Germany in the past.

I would therefore plead that when the war is over the British magneto manufacturers be given to the full encouragement and support by Government and public alike, so that there may be established on a solid foundation a British magneto industry that will endure through the years to come—an industry producing magnetos and ignition apparatus for aeroplanes, motor cars, and other purposes, of superlative quality and design, not surpassed by anything manufactured outside of these little Isles.

HISTORICAL.

All electrical systems of ignition are direct descendants of Faraday's great discovery of electro-magnetic induction made during the autumn of 1831, when for the first time in the world's history he succeeded in producing a spark by electro-magnetic means. He was experimenting with his classical iron ring wound with primary and secondary when he found, to his great joy, that by either closing or opening the primary circuit it was possible to obtain a tiny spark between two carbon pencils separated by a very small distance and connected to the ends of the secondary.

The first system of electric ignition ever used was devised by Lenoir in 1860. He utilised the high-tension spark of a Ruhmkorff coil for ignition purposes, employing a high-tension distributor for connecting the secondary winding first to one plug and then to the other. It is worth noting that the modern battery system of ignition now used most extensively in America is strikingly similar to the old Lenoir system, even to the detail of introducing an extremely small air gap between the rotating metal brush and the distributor segment—a method of distribution that is now being followed on magnetos. Lenoir was also the inventor of the spark plug, and the type of plug which he designed for use in conjunction with his ignition scheme of 1860 had all the features of the modern spark plug.

Marcus appears to have been the first man to construct a

magneto for ignition purposes. His was a low-tension machine, having the now familiar form of H armature, the current induced in the winding being broken at predetermined times in the cylinder by a system of cams and levers.

In 1898 Simms and Bosch developed a low-tension magneto, using a fixed H armature and rotating segments for producing the necessary flux changes in the armature core. This is of special interest, because, subsequently, by the addition of a secondary winding on the same armature core, a high-tension magneto was evolved.

The Bosch Company, of Stuttgart, Germany, must receive the credit of having thoroughly established the fact that a high-tension magneto can be manufactured on a commercial basis, to give reliable and efficient ignition in practice. Although this important industry was allowed to develop in Germany, the modern H.T. magneto was first conceived in France by the Frenchman M. Boudeville,* who unfortunately omitted to include a condenser in his scheme for eliminating sparking at the contact points.

A condenser is a vital part of every magneto; without it the machine would be quite impracticable. It is surprising that Boudeville should have overlooked this feature, because here, again, the idea of using a condenser for such a purpose is of French origin, the Frenchman Fizeau being the first to suggest, in 1853, connecting a condenser in parallel with the contacts on a Ruhmkorff coil, to prevent excessive sparking.

FUNDAMENTAL CONSIDERATIONS.

Any form of high-tension magneto consists of four essential parts:—

- (1) A magnet system.
- (2) An iron core wound with primary and secondary.
- (3) A contact breaker to interrupt the primary circuit at predetermined intervals.
- (4) A high-tension distributor.

The arrangement of connections generally adopted is as follows:—The earthed primary contact is actuated by some form of cam so that the primary circuit is continually being closed and opened.

The iron core which carries the armature windings may either revolve or be fixed. In the latter case the rotor comprises certain iron masses so disposed that every 90 deg. or 180 deg. (depending upon whether the magneto is a two-spark or a four-spark), the flux flowing from the N pole of the magnet to the S pole, through the armature core, is suddenly reversed.

When the armature rotates the flux reversal occurs—except when specially-shaped poles are fitted—every 180 deg., and the magneto gives two sparks per revolution.

Magnetos provided with stationary armatures are said to be of the inductor type. To prevent confusion we shall adopt the following nomenclature:—

- (1) When the rotor comprises iron segments built in the form of a sleeve, which revolves around the stationary armature, we shall call the machine a "Sleeve Inductor" type magneto.
- (2) When the rotor comprises iron masses operating in conjunction with an external armature core, we shall call the machine a "Polar Inductor" type magneto.
- (3) When the armature rotates—as is more usually the case—we shall call the machine a "Rotating Armature" type magneto.

Dealing first with the problem in the abstract, we give a description of the cycle of operations that is applicable to any particular construction.

(a) The rapid reversals of flux in the armature core induce in both primary and secondary an alternating E.M.F., the maximum E.M.F. being reached for any given speed, when the actual flux in the armature core is substantially zero.

(b) The cam operating the contact breaker lever is so designed that the primary circuit is closed during the period when the induced voltage is growing from zero to its maximum value, and for some little while afterwards, but not until the voltage has become zero again.

(c) During the period of closure of the primary circuit the induced current will steadily increase in value. Then at a certain instant the contacts are certainly separated by the cam. The condenser in parallel with them ensures that there is no sparking at this instant, so consequently the rupture of the primary current is remarkably sudden.

(d) The sudden rupture of the primary current causes an instantaneous collapse of the magnetic field associated with it, and as this field is linked with the secondary turns, an enormous voltage is induced in the secondary winding at this instant. This voltage is sufficient to initiate a spark between the electrodes of the spark plug, and this spark is maintained to some extent by the voltage induced in the secondary by virtue of the continual flux change in the armature core produced by rotation during the period that the contacts remain open.

* See "Magneto for Electric Ignition," by H. Armagnat, in "La Revue Electrique"—Translation in "The Electrician," March 24th and 31st, 1916—which deals fully with the history of electric ignition.

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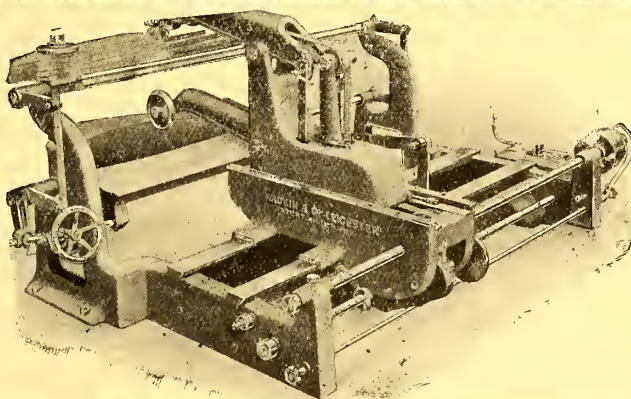
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(e) After a certain short interval of time the cam allows the contacts to close again, and the cycle of operations (b) (c) (d) (e) is repeated.

THE PHENOMENA THAT OCCUR IN THE SECONDARY AT "BREAK."

(a) Induced Secondary Voltage.

Prior to "break" a certain amount of energy is stored in the primary winding by virtue of the magnetic field associated with the current induced in that winding by rotation. The magneto is designed so that at the instant when the contacts separate this energy can be transferred magnetically to the secondary winding to reappear at the points of the spark plug in the form of a high-tension discharge at very much higher potential.

The rate at which the secondary voltage rises and the value of the maximum reached are dependent on the primary current broken; on the self-induction of the primary at "break"; on the ratio of turns; and on the characteristics of the magnetic circuit. In other words, it is necessary that the magnetic field created by the primary current shall instantly collapse at "break." Obviously, the rate at which the magnetic field disappears is, other things being equal, vitally dependent upon the characteristics of the magnetic circuit through which this magnetic field is passing. By this I mean that a magnetic circuit which is totally laminated will ensure a more rapid dying away of the magnetic field than will occur if there are in the magnetic circuit any solid masses in which eddy currents may be set up during the period of change, these eddy currents, by their reaction, tending to retard the rate at which the collapse of the magnetic lines occurs.

The character of the secondary voltage wave during the period of the high-tension discharge is of considerable importance, because the maximum value reached would seem to have some influence on the power of the spark to produce ignition. Furthermore, the shape of the wave controls, to some extent, the rate at which the energy liberated in the high-tension spark is dissipated, and I hold the view that the rate of energy discharge is of more importance than the total amount of energy liberated, although the latter factor must be taken into consideration.

It is a very difficult matter to investigate this point quantitatively, but experiments made on magnetos, using a special valve known as a Kenotron,* which has been developed in one of the largest Industrial Research Laboratories in America, indicate that the voltage rise in the primary winding at the instant of "break" is very much greater than one would anticipate. It is reasonable to suppose from these experiments that a correspondingly abnormal rise of voltage occurs in the secondary at "break"—this voltage, of course, only being maintained for an infinitesimal period of time.

I assume the voltage suddenly rises to a maximum and then suddenly falls again, the rise and fall occupying a time T_1 , during which period there is no actual discharge between the electrodes, but the gases in the vicinity are being ionised preparatory to a discharge, and is maintained during the subsequent period T_2 , at the end of which the voltage has dropped away to zero. The voltage corresponding to the maximum point on the curve I will call the "maximum voltage," whereas the voltage at the beginning of the discharge period T_1 I shall call the "spark voltage." As soon as the spark is initiated the discharge is maintained to some extent by the voltage induced in the secondary winding in consequence of rotation, and this voltage is virtually superimposed upon the voltage induced as a result of the collapsing of the magnetic field stored in the primary prior to break.

(b) The process of Ignition.

Unfortunately, the present state of our knowledge concerning the process of ignition by means of a high-tension spark is by no means complete, but I rather suspect that the maximum value of the secondary voltage reached is a controlling factor, and it is even within the bounds of possibility that the ionisation occurring as a result of the sudden application of an enormous voltage during the extremely small interval of time T_1 , may in itself be sufficient to initiate the explosion. It has been demonstrated† that ionisation in itself will produce an explosion even though no spark occurs, and I am inclined to the opinion that the apparent superiority of the polar inductor type of magneto over the rotating armature type is due to the fact that the secondary voltage wave is steeper, and reaches a higher maximum during the interval T_1 , in consequence of the armature circuit being more thoroughly laminated, and, therefore, allowing of a more rapid flux change.

*For a detailed description of the theory and working of the Kenotron, see article in "General Electric Review" for March, 1915.

†An excellent article on "Spark Ignition," by J. D. Morgan, A.M.I.C.E., A.M.I.E.E., appeared in "Engineering" for November, 3rd, 1916. See also numerous papers by Dr. W. M. Thornton in Proceedings Roy. Soc. and Phil. Mag.

‡See "Notes on the Ignition of Explosive Gas Mixtures by Electric Sparks," by J. D. Morgan, A.M.I.C.E., A.M.I.E.E., in the Journal of the Institution of Electrical Engineers, Vol. 54, Jan. 15th, 1916.

The process of ignition by high-tension spark is a subject worthy of Government research, and if in the future action is taken in this direction, I would suggest that experiments be conducted with magnetos of both the polar, inductor, and rotating armature types, with a view to ascertaining to what extent the process of ignition is dependent upon the shape of the secondary voltage wave, and whether, as suggested above, the ionisation that must occur during the initial period T_1 , is a predominant factor.

(c) THE "SPARK-GAP" TYPE OF DISTRIBUTOR AND BRUSH.

When discussing this question it is not out of place to consider what is termed the "spark-gap" form of distributor. A common trouble experienced with the ordinary type of distributor in which a carbon brush is used is that the carbon dust generated is liable to be ground into the brush track of the distributor, thus producing a path of low resistance between the segments, this disease being known as "tracking." In certain cases, and particularly when two six-cylinder magnetos are used in conjunction on a 12-cylinder engine, tracking of this kind is very liable to cause misfiring, because the spark, rather than discharge between the electrodes of the spark plug in the cylinder under compression, will leap along the surface of the brush track in the direction of rotation to the next segment which is connected to a spark plug in a cylinder at practically zero pressure, the resistance of this alternative path being extremely low.

Experiments have shown that even with a distributor that is badly tracked misfiring can be entirely eliminated if, instead of the ordinary carbon brush, a metal brush be used, this being so arranged that there is a very small air gap (about 0.001 in.) between the face of the rotating metal brush and the distributor segment. The superiority of this arrangement over the distributor and carbon brush combination would seem to be due to the fact that the introduction of a small air gap in the high-tension circuit, such as is interposed between the end of the secondary winding and the outside circuit, completely insulates the secondary during the small interval of time T_1 , and thus allows the voltage to rise to a very much higher maximum value than would be the case if there were any leakage paths of low resistance.

This is a further confirmation of the view that the value of the maximum value of the secondary voltage at "break" is of vital importance, and I would add that the spark-gap form of distributor has been tried with considerable success on aeroplane magnetos both in this country and in France, and, as a matter of fact, it is used generally on all the battery ignition systems designed for automobile work use in America. In my opinion, it would seem to be an advance in the right direction provided that sufficient care is given to the design of the brush-holder and proper precautions are taken to ventilate the distributor so that the products of ionisation resulting from the minute spark between metal brush and segments have easy means of escape. This has been done in the type "A" magneto, which I shall describe in detail later, and many thousands of these machines fitted with this special form of distributor-brush have been supplied for use on aeroplanes, and the consensus of opinion seems to me that the arrangement adopted is entirely satisfactory.

MAGNETS—IMPORTANCE OF FLUX.

The function of the magnets is to produce and maintain, in spite of the very severe conditions under which a magneto has to operate—including severe vibration and cyclic changes in temperature—a practically constant flux in the armature core. I have already shown that the energy liberated in the high-tension spark is substantially proportional to the square of this flux, so that the necessity of using magnets of correct design and superlative quality is at once apparent.

For any given machine using magnets of some definite design the value of the armature core flux "N" is naturally dependent on the magnetic characteristics of the magnets used. In comparing permanent magnets of different quality, it is usual to determine the remanence (BR) and the coercive force (CF). These factors apply to a closed ring of the steel which is capable of being completely and uniformly magnetised. By varying the current in the magnetising coil, the steel can be taken through a cycle of magnetisation.

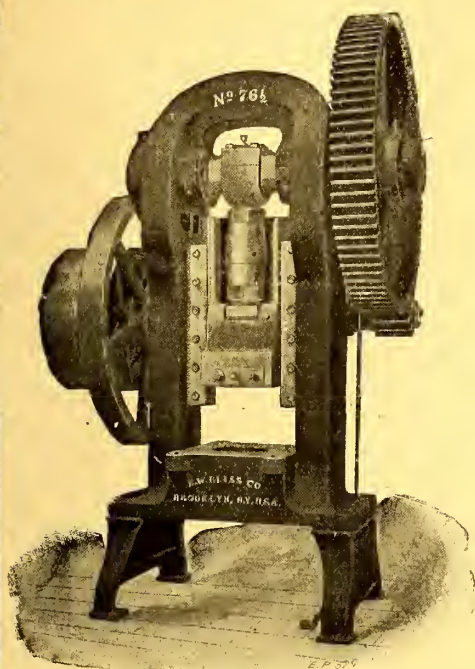
The remanence is the flux density in the steel, after the magnetising force H_{max} (usually 400) has been removed, and the coercive force is the demagnetising force that has to be subsequently applied to reduce this flux density to zero. When testing a magneto magnet, the ideal "ring" condition can be approximated by bridging the poles with a soft iron keeper and suitably winding the magnet. A fundamental test of this kind is, however, attended with considerable difficulties.

It is the practice of the B.T.H. Company, and, I believe, of most other magneto manufacturers in this country, to test every magnet by means of certain special apparatus before it is fitted to a magneto to determine both of these factors. So far as we are concerned, we accept only those magnets which show on this magnetic test a remanence and coercive force in conformity with the following:—

(1) The product of remanence and coercive force in C.G.S. units must not be less than 580,000.

(2) The actual coercive force must not be less than 55.

Experiment has shown that the active armature core flux in



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a magneto of given design is greatly dependent on the product of remanence and coercive force, or upon what I shall term the "magnet strength," using this expression to denote the factor $\frac{(BR \times CF)}{10^4}$. The spark energy output, being proportional to the square of the armature core flux, must in consequence be dependent on the magnet strength to a much greater degree.

The product remanence and coercive force is therefore a very important factor, and, generally speaking, it is sufficient when testing magneto magnets to measure this product only, because as a general rule a magnet which shows a product of not less than 580,000 will have a coercive force not less than 55. In other words, such a relatively low coercive force as 55 is usually associated with a remanence of the order of 10,500.

Looking at a magneto magnet from a purely mechanical standpoint, it is necessary that the pole faces, and also the edges, should be finally ground after hardening to a fairly fine degree of accuracy. It is of great importance that the ground pole faces be parallel to each other and exactly at right angles to the ground edges. Some idea of the degree of accuracy required can be gathered from the following limits, which are now being worked to by Sheffield manufacturers:

Distance between the ground pole faces—Max. +0.2 mm.

Distance between the ground pole faces—Min. -0.2 mm.

Width of magnet—Max. +0.15 mm.

Width of magnet—Min. -0.15 mm.

These limits may at first sight appear to be large, but it should be remembered that a hardened tungsten steel magnet is a very difficult thing to grind, particularly when it comes to grinding the inside pole faces, because trouble is encountered due to the springiness of the magnet itself.

Before leaving this aspect of the problem I should like to make some reference to the very excellent way in which the various Sheffield steel manufacturers now engaged on the manufacture of permanent magnets have carried out their work. Bearing in mind that at the outbreak of war practically no permanent magnets were produced in this country, and that this subsidiary key industry was entirely in the hands of Germans, I think that all those who have been closely in touch with the progress that has been made in the development of a magnet industry in this country will agree that the results so far achieved are very gratifying, and reflect great credit on the British steel manufacturers, who, by virtue of their resourcefulness and skill, have grappled so successfully with this difficult problem. Our own experience is that at the present time permanent magnets for magnetos are being produced in this country which are quite equal—and in many cases superior—to anything that has been produced in Germany in the past, and I am glad to know that Mr. E. A. Watson, technical director of the M.L. Magneto Syndicate, Ltd., holds views which coincide with my own in regard to this important question.

(To be continued.)

A MINIATURE SPARKING PLUG.

The Forward Motor Co., of Summer Row, Birmingham, are manufacturing a special sparking plug for rotary aero-engines which is certainly one of the smallest and neatest yet produced. Its weight is only 1½ oz., but, nevertheless, it is very substantially made. The size of the body has been reduced to the utmost limit, but every attention has been paid to its gas-tight properties. The electrodes are exceptionally heavy, and unlikely to burn, and the insulator is formed of the very best Indian ruby mica. Naturally, the body has the standard plug thread, but the height has been reduced to the smallest possible limit, the barrel from the top of the thread upwards being only ⅛ in. deep. The total height of the plug from the ends of the electrodes to the extreme top is only 1½ in. The whole job is exceedingly well turned out and appears to be a distinct advance over some of the very heavy plugs which are used in rotary engines. The price of the plug is 9s., which is not high considering the fine workmanship employed.

A PRESENTATION.

An interesting ceremony took place on the 5th inst. at the Aviation Department of Messrs. Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, when Mr. Henry Knowler, A.M.I.M.E., of Sutton, Surrey, Chief Technical Assistant, was presented with a handsome chiming clock and a pair of silver candlesticks by Mr. H. S. O'Brien, chief draughtsman, on behalf of the members of the department, on the occasion of his marriage on the 10th inst. to Miss Doreen Phillips, of Thornton Heath.

GOOD WISHES.

On Thursday, April 19th, Mr. Geoffrey Ernest ffiske, youngest son of Mr. Henry ffiske, of Holm Close, Brundall, Norfolk, is to be married at St. Paul's Church, Knightsbridge, S.W., to Ethel Mary, only daughter of Mr. Alfred Dandridge, of Brookleigh, Beckenham.

The bridegroom-to-be has taken a very prominent part in the management from its inception of the Aircraft Department of the old-established firm of Boulton and Paul, Ltd., of Norwich, and to him is due much of the credit for the planning and organisation of the very finely designed and splendidly equipped factory which the firm, of which he was recently appointed a director, has erected for aircraft work.



Mr. G. E. ffiske, of Norwich, Chief of the Aircraft Department of Boulton and Paul, Ltd.

Mr. Geoffrey ffiske, despite his proved ability as an engineer and organiser, is still well on the sunny side of 30, and before the war he had already made a reputation for himself by his skill as a designer and pilot of speedy motor boats.

To his ability as organiser he adds a vast amount of energy and enthusiasm, and he takes an unbounded interest and pride in the welfare of all who work under the "B. and P." banner, as instanced by that excellent institution, the "B.P. Magazine."

Like a good many other people concerned with aviation, Mr. ffiske obtained his first knowledge of engineering under Mr. J. W. Wilson, at the old Crystal Palace Engineering School, and his subsequent success in connection with internal combustion engines, motor boats, and now with aeroplanes, shows that he has kept thoroughly in touch with the most modern ideas.

All will wish him and his bride all good fortune and happiness.

THE NEW PRESIDENT OF THE M.T.A.

At a crowded annual general meeting of the Motor Trade Association recently Mr. Arthur Goodwin, of C. A. Vandervell and Co., was once again elected President. Mr. Goodwin's first year of office was an exceedingly arduous one and entailed much time and called forth all the tact and diplomacy of which he was possessed. However, as 700 new members joined during the year, Mr. Goodwin's first year of office was evidently a brilliant success.

A CHANGE OF ADDRESS.

It should be noted that the Aeronautical Society of Great Britain has now removed to new offices at 7, Albemarle Street, Piccadilly, W.1. The telephone number is Gerrard 7373, and the telegraphic address is "Didaskalos, London."

The Aeronautical Society are certainly to be congratulated upon taking this step, as it will place their offices in easy reach of the Royal Flying Corps Club and the Royal Aero Club, as well as to the various other haunts frequented by those concerned with aviation.

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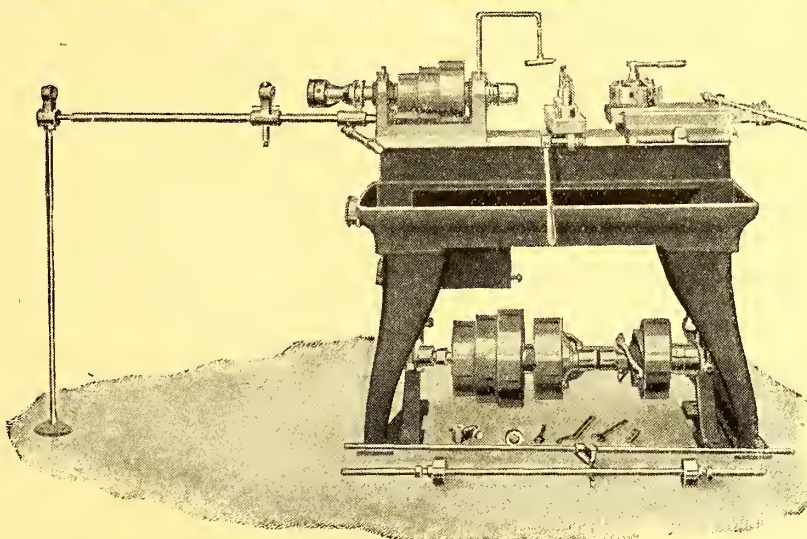
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MARKET REPORTS.

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April 5th, 1917.

COPPER.—There has been no fluctuation whatever in prices. Steady supplies are being received, and there is plenty of available scrap metal. There does not appear to be any likelihood of prices advancing.

Current prices:—Standard cash terms to-day, £136. A week ago, £136. A month ago, £139. A year ago, £115. Copper Sheets, £174. Copper Tube, 20½d. Brass Tube, S.D. 18/19 G., 17½d. Brass Sheet, 24 G., 16 5-8d.

STEEL.—The Air Board are practically controlling the whole output of mills turning out R.A.F. steels, and distributing supplies to the factories. Prices are being kept at a fair level, but there is very little possibility of a reduction in prices. The supplies of cast steel are behind the demand, and buyers should very closely watch their contracts for this, also their file requirements.

Current average prices.—R.A.F. 3A Steel, 48s. to 52s. R.A.F. 1E Steel, 82s. R.A.F. 9A Steel Sheet, 29s. to 30s. Plus tests.

ALUMINIUM.—There is no further alteration in the official prices, and supplies are very regular.

Official prices.—Ingots, £225. Remelted, £210. Aluminium Sheet, 19 gauge, 2s. 10½d.

TIMBER.—The shipments of mahogany recently received are very encouraging, and it is expected that good deliveries will continue. Unfortunately this cannot be said of silver spruce.

English ash remains firm, and there appears to be ample supplies for present requirements.

Current prices.—Silver Spruce, 13s. 6d. to 14s. 6d. English Ash, 12s. to 13s. Walnut, 2s. 6½d. s.f. Mahogany Plk., 1s. 11½d. to 2s. 1d. s.f. Prices are for selection and delivery.

FABRIC.—Although the official notification of the price of linen fabric has not been issued, it is more than likely that the price will be between 29d. and 30d. per yard, 36 in. wide.

The price of Irish flax has risen to an abnormal figure, and it is generally felt that this has been due to official control of the fabric. The highest price reached last year for 17C fabric was 2½d per yard ex mills.

A RECOGNITION OF PHILANTHROPY.

On the analogy of the well-known alliterative advertisements of our old friend, Mr. Robert Coan, who "Casts Clean Crank Cases," the following excerpt from the "St. Pancras Gazette" might well be headed, "Coan Continually Consolidates King's Cross Kindness."

"An interesting gathering took place at King's Cross recently when the Executive Committee of the King's Cross Philanthropic Society entertained their President, R. W. Coan, owner of the Aluminium Foundry, 219, Goswell Road, E.C., in recognition of his services to forward the cause of the Society during his twenty-five years' connection with it.

"The chair was occupied by Guardian H. J. Goss, who, in proposing 'Our Guest and President,' expressed the appreciation of the Society for the excellent work done by Mr. Coan and the many kindnesses the Committee had received at his hands. To his liberal and far-sighted judgment many of the most successful features of their present administration were largely due; and carrying his mind back over the quarter of a century during which he had worked side by side with Mr. Coan on the Committee, he hoped to work with him for many years to come.

"The President, in reply, thanked his old friends for the honour they had paid him in making him their guest, and for the able assistance they had given him in carrying on the work of the Society. He expressed the wish that in years to come their children would continue the good work they were doing to-day.

"After the dinner, the whole party adjourned to a theatre to conclude an exceptionally happy evening."

The K.C.P.S. is to be congratulated on its President, and the President on his Society. As one who has known Mr. Coan and his engineering work for more years than he cares to count, the writer can well believe that Mr. Coan's philanthropy is as clean and as worthy of reliance as is all his other work. Long may he and his work flourish.—C. G. G.

A WAR MEASURE.

The Rotax Motor Accessories Co., Ltd., announce that, owing to shortage of staff occasioned by the war, they have been compelled to close temporarily their Manchester depot, at 291-293, Deansgate, which will be reopened immediately after the war.

In the meantime all business will be conducted from the Rotax Works, Willesden Junction, N.W.6., and all correspondence should be sent to that address.



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- 4469. W. E. Back. Flying machine. 28/3/17.
- 4657. A. Cazanave. Aeroplanes. 30/3/17.
- 4636. C. D. Douglas. Aeroplanes, etc. 30/3/17.
- 4596. A. J. Liversedge. Rigid dirigible airships. 29/3/17.
- 4597. A. J. Liversedge. Dirigible airships. 29/3/17.
- 4467. E. M. Tritsch. Speed, course, and stability indicators for flying machines. 28/3/17.

SPECIFICATIONS ACCEPTED THIS WEEK.

- 101,427. E. J. M. Percevaux. Screw and like propellers.

SPECIFICATIONS PUBLISHED THIS WEEK.

- 104,708. J. J. Jackson. Flying machines.
- 104,747. T. N. Lupton, sen., and T. N. Lupton, jun. Mechanical wings for aircraft.
- 104,769. H. O. Short. Dirigible balloons or airships.

LATEST PUBLISHED ABSTRACT.

- 17,437. Aeronautics. A. A. Holle, Bisham Lodge, Speer Road; A. W. Judge, "Summerfield," Ashley Road, both in Thames Ditton, Surrey; and Varioplane Co., 34, Gresham Street, London.

Aeroplanes are provided with a detachable frame adapted to form an extension of the fuselage, the engine, propeller, and gearing, when this is used, being carried by the frame, which may also carry the tanks for petrol and oil and the silencer, so as to form a complete interchangeable power unit. A casing carrying the engine, propeller and tanks, the casing being preferably enclosed and conforming to the outline of the fuselage, to which it is adapted to be secured by bolts, etc. The various elements carried in the casing may be adjustable so as not to displace the centre of gravity of the machine when one power unit is replaced by another of different weight.

Instead of adjusting the elements in the casing the plane and landing-chassis may slide on longitudinal tubes and be clamped thereto in various positions.

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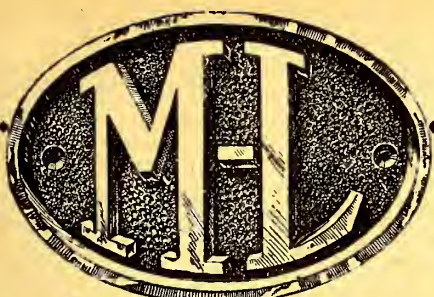
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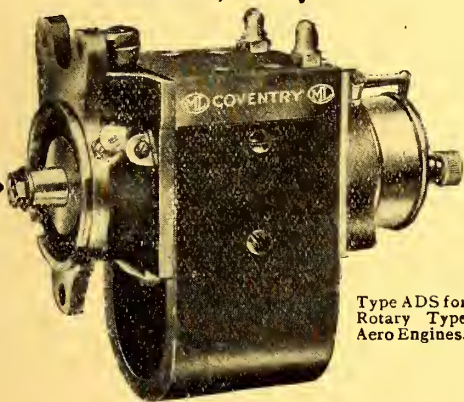
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Boulton & Paul, Ltd., Rose Lane Works, Norwich

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol.

British Caudron Co., Ltd., Broadway, Cricklewood, N.

Canute Airplane Co., Royal Pier Gate, Southampton.

Central Aircraft Co., Palmerston Works, High Rd., Kilburn, N.W.

Curtiss Aeroplane Co., L. J. Seely, Clun House, Surrey St., Strand, W.C.

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Eastbourne Aviation Co., Ltd., Eastbourne

Grahame-White Aviation Co., Ltd., London Aerodrome

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(Continued from page 910.)

Hill, Lt., A.S.C. and R.F.C., son of Mr. Joseph Hill and Mrs. Hill, of Bordon, Hants, was married to Dorothy, fourth daughter of the late Mr. S. J. Plowman and Mrs. Plowman, of Brighton.

* * *

TYLER—HARDY.—On April 4th, at All Saints', Bishop Burton, Beverley, by the Rev. W. A. Pearman, James Herbert Tyler, R.F.C., was married to Doris Mary Hardy.

An officer of the R.F.C. when flying in the neighbourhood of Walsall on April 7th made a forced landing in a garden in which an old lady was carrying in her arms a baby granddaughter. In avoiding the houses at the back of the garden the aeroplane seems to have struck the woman and child, as both were found dead by a policeman. The pilot was taken to hospital with a cut face and suffering from shock, but his injuries are not regarded as severe.

* * *

The special correspondent of the "Telegraph," writing on the British advance on Beaumetz-les-Cambrai and the village of St. Leger, says:—

Our aeroplanes were up and circling round, in spite of German shrapnel puffing white clouds about them. They signalled down to our field batteries, and the gunners found the target, this human target, moving between two villages. In the words of one of the officers directing the operation, "we made a mess of them," and that is an exact description.

A second attempt suffered the same fate. Our aviators were more than usually audacious, and stooped low enough to join in the kill, swooping above the heads of the German infantry and playing machine bullets into their mass. Two German aviators were brought down, whether by "Archies" or an air-craft duel is the subject of rival claims, and were captured alive.

* * *

It is stated on credible authority that the regulation recently issued forbidding officers in the R.F.C. to wear the ordinary tunic and ordering them to wear instead the regulation double-breasted Flying Corps tunic has been rescinded. It would be interesting to know whether the order as originally framed was a contravention of the Royal Warrant which decrees that officers seconded to other units may wear the uniform and badges of their own corps.

It is stated, also, that there is no truth in the rumour that Field Officers, R.F.C., are to wear miniature four-bladed propellers as rowels to spurs.

FRANCE.

OFFICIAL COMMUNIQUÉS.

APRIL 4th.—In the Vosges a German aeroplane was brought down by the fire of our anti-aircraft guns.

ARMY OF THE ORIENT.—The enemy dropped several bombs from aeroplanes on the hospital at Vertekop (near Vodena). British aviators successfully bombarded the hangars at Hudovo (south-west of Strumnitza), causing explosions and fires.

APRIL 5th.—ARMY OF THE ORIENT.—French aeroplanes twice bombarded the enemy's battery north of the village of Garvan (Dobrudsha).

APRIL 6th.—During the day our aviators destroyed two German captive balloons.

APRIL 7th.—AVIATION.—On Thursday night one of our air squadrons made several sorties, and dropped 440 kilograms (nearly half a ton) of explosives on the enemy's establishments at Damvillers, Spincourt, the Forest of Maugienne, and the Bili Wood.

German aeroplanes last night dropped several bombs in the region of Nancy. There were no losses and no damage was done.

APRIL 8th.—AVIATION.—Last night German aeroplanes dropped bombs on Belfort, but no damage was done and no casualties inflicted.

ON THE FRONT OF THE ALLIED ARMIES OF THE EAST, the British air forces bombarded the enemy installations at Hudovo in the Valley of the Vardar, from Cestovo to the north-west of Lake Dorian.

APRIL 9th.—ARMY OF THE ORIENT.—A German aeroplane was brought down south of Lake Doiran. Two officers and a mechanic were taken prisoners.

GERMANY.

OFFICIAL COMMUNIQUÉ.

APRIL 3rd.—In the course of air fights the enemy lost four aeroplanes, two of which were shot down by Baron von Richthofen.

APRIL 7th.—Batteries, ammunition dumps, and works of fortification in Reims, the existence of which has been revealed by photographs taken by our aviators, together with collections of troops which have been observed in the same city, were brought effectively under our fire.

For the purpose of enforcing artillery observation and reconnoitring, the enemy employed strong concentrated aerial fighting forces. They suffered heavy losses. Several of the enemy squadrons may be considered as destroyed.

Lt. Voss shot down his 24th and Lt. von Bertrab his 4th enemy machine in the course of an aerial fight.

Between Soissons and Reims the enemy launched a combined attack against our captive balloons on this front. Owing to the quick action of our anti-aircraft guns and the intervention of our chasing squadrons the enemy did not obtain the hoped-for result. Only two balloons were shot down, and their observers landed by means of parachutes.

The enemy lost yesterday 44 aeroplanes, 33 of which were lost in the course of an aerial fight, 8 were destroyed by anti-aircraft guns, and 3 were forced to land behind our lines, while a captive balloon was also destroyed in the course of our aerial attack. Five of our aviators have not returned.

NAVAL.—During the night of April 5th a German seaplane squadron lavishly and successfully bombed vessels lying in the downs and searchlights and fortification north-west of Ramsgate.—(Signed) Chief of Admiralty Staff.

APRIL 8th.—Yesterday 12 enemy aeroplanes were shot down in aerial battle and 1 by anti-aircraft fire.

The anticipatory development of our aerial fighting forces, the perfection in the building of aeroplanes on the basis of experience gained from the enemy and at home, the tutoring of observers for artillery and infantry, and the maintenance of the established attacking spirit of our fighting aviators have led to great results during March. In securing these results our anti-aircraft guns also played a considerable part.

Our opponents, including the Americans who were in the French Aerial Service for a long time prior to their country's declaration of war, have lost in the West, East, and in the Balkans 161 aeroplanes and 19 captive balloons by our attacks and anti-aircraft devices. Of these 143 aeroplanes and the 19 captive balloons were shot down in aerial attack, and 15 aeroplanes were shot down by fire from the ground. Three enemy aeroplanes came into our possession by involuntary landing behind our lines. The German losses amount to 45 aeroplanes. No captive balloons were lost.

[The admitted loss of 45 aeroplanes means, undoubtedly, those lost behind the French and British lines, and does not include any crashed in territory held by German troops, which although out of action are in German hands and, therefore, theoretically not "lost." This method of calculating losses reminds one of the Irishman who, after dropping his kettle overboard from an Atlantic liner, refused to accept sympathy in his loss, on the grounds that the kettle was not lost because he knew where it was, namely, "at the bottom of the sea."—Ed.]

APRIL 9th.—ARMY GROUP OF THE CROWN PRINCE.—Yesterday 17 enemy aeroplanes and two captive balloons were brought down by our aviators and anti-aircraft guns.

Cavalry Capt. Baron von Richthofen was victorious for the 38th and 39th times in aerial battles.

Lt. Schaefer brought down his 12th enemy machine.

WESTERN FRONT.—Nine enemy aeroplanes and two captive balloons were shot down by our aviators.

FRONT OF GENERAL VON MACKENSEN.—Our air squadrons lavishly bombed Vertekop railway station, south-west of Vodena. The conflagrations which were caused were photographed.

RUSSIA.

OFFICIAL COMMUNIQUÉS.

APRIL 3rd.—BLACK SEA.—On March 27th, during a raid by our seaplanes on Terkos (27 miles N.W. of Constantinople), one of them was hit by the enemy. The petrol tank being punctured, the machine was compelled to descend. The aviators, Lt. Sergeev and Sub-Lt. Tur, seeing a Turkish schooner, attacked it, opening machine-gun fire. The crew thereupon left the schooner.

Our aviators, having sunk their machine after taking from it the compass, machine-gun, and valuable belongings, boarded the schooner and set sail to our shores. They encountered a heavy storm during their adventure, but arrived with the schooner at the Djarilagatch Peninsula (north of the Sevastopol) on April 1st. From this place our aviators returned to Sevastopol on a torpedo-boat.

The only provisions available on the schooner consisted of a few pieces of bread and little fresh water.

APRIL 6th.—Ten of our aeroplanes made a flight in the direction of Sokal, and dropped bombs on the station depots of the railway in the neighbourhood of the village of Kutý (south-west of Svinichi) and also on several other points occupied by enemy troops.

BLACK SEA.—Our seaplanes, under fire from the enemy's battery, carried out an aerial attack on the Bosphorus. Having successfully dropped bombs on the fortifications, all our machines returned to their vessels, the latter being attacked by enemy aeroplanes.

ROUMANIA.

OFFICIAL COMMUNIQUÉ.

APRIL 3rd.—A powerful squadron of 19 Russian, French, and Roumanian aeroplanes bombarded enemy monitors north of Braila.

SERBIA.

OFFICIAL COMMUNIQUÉ.

APRIL 2nd.—Our aviators had several fights, and dropped bombs on the enemy's encampments near Gradeshnitza (east of Monastir).

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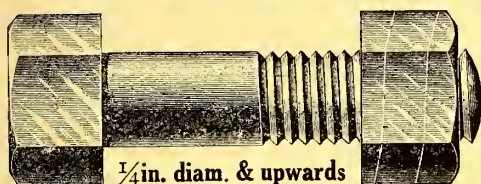
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AIRCRAFT IN THE HOUSE.

On April 3rd **Mr. Pemberton-Billing** asked the Under Secretary of State for War how many commissioned officers of the Royal Flying Corps are at present attached to Adastral House or the Hotel Cecil; and how many of these are certified pilots?

Mr. Macpherson: The number of commissioned officers of the Royal Flying Corps at present attached to Adastral House and the Hotel Cecil is 207, of whom 29 are certificated pilots.

Mr. Billing: In view of the great pressure at the front to get certified pilots, and in view of the sending out of partially trained men, will the hon. gentleman consider the advisability of sending out some of these certified men?

Mr. Billing asked the First Lord of the Admiralty if he will state how many commissioned officers of the Royal Naval Air Service are at present attached to the Hotel Cecil or the Admiralty; and how many of these are certificated pilots?

The Parliamentary Secretary to the Admiralty (Dr. Macnamara): Two hundred and nine commissioned officers connected with the Royal Naval Air Service are at present attached to the Royal Naval Air Department at the Hotel Cecil and the Admiralty, of whom 38 have qualified as pilots, including the Fifth Sea Lord.

Mr. Billing asked the First Lord of the Admiralty what proportion of the certificated pilots in the Royal Naval Air Service are on active service?

Dr. Macnamara: Approximately 84 per cent. of the trained pilots borne are on active service at home and abroad.

LAUNCHING AEROPLANES FROM WARSHIPS.

Mr. Billing asked the First Lord of the Admiralty whether he will consider the advisability of appointing a special committee of experts for the purpose of endeavouring to solve without further delay the problem of launching aeroplanes from and returning to warships under active service conditions.

Dr. Macnamara: The whole question is receiving the most careful consideration.

Mr. Billing: Is the right hon. gentleman aware that the question affects the visibility of the Fleet, and that it has received no serious attention at all for two and a half years, and will he see that it does?

Dr. Macnamara: I have just said it is receiving the most careful consideration.

Mr. Billing: Can he say whether it is satisfactory?

RAIDING SQUADRON.

Mr. Billing asked the First Lord of the Admiralty whether he will consider the advisability of organising a raiding squadron composed of pilots and machines at present unemployed in this country?

Dr. Macnamara: All the possibilities of employing aircraft are fully considered by those responsible. All the machines in this country have a definite purpose in view.

RAIDS AGAINST ENEMY CENTRES.

Mr. Billing asked the First Lord of the Admiralty why it is held to be in the interests of the country to withhold information in connection with the air raids which have been carried out in the past against enemy centres and submarine bases?

Dr. Macnamara: Communications respecting such raids have from time to time been issued to the Press.

Mr. Billing: Are we to understand that all the raids which have taken place from Dunkirk in the last twelve months have been communicated to the Press?

Dr. Macnamara: I say that communications have been issued to the Press, and I observe that as regards various raids there have been no fewer than 27.

Mr. Billing: Are we to understand that for the last twelve months a matter of many thousands of machines have only initiated 27 raids?

Dr. Macnamara: I did not say that.

Mr. Billing: Then what are we to understand? I beg to give notice that owing to the unsatisfactory nature of the reply I shall raise the whole question of the Naval Air Service on the Motion for the Adjournment for Easter.

RIGID AIRSHIP TRIALS.

Mr. Billing asked the First Lord of the Admiralty whether the authorities are satisfied with the results obtained at the trial of the new rigid airship which has been constructed for the Royal Naval Air Service?

Dr. Macnamara: It is not considered desirable in the public interest to give any information respecting rigid airships in this country.

Mr. Billing: May I ask if the right hon. gentleman will give serious consideration to the advisability of the cessation of the wasting of public money on these experiments, which cannot be productive in this war?

AEROPLANE'S STABILITY.

Mr. Billing (by Private Notice) asked the Under Secretary of State for War whether he is aware that the aeroplane known as R.E.8 has proved spirally unstable; whether it is true that while taking deliveries of these machines at Coventry 15 machines were smashed; whether civilian testing pilots have refused to fly this type of machine; whether it is true that in spite of the fact that this machine has proved a complete failure in France, a contract has been placed for — of them; and whether, under

these circumstances, he is prepared to cancel this order and to withdraw this machine both from active service and in peace time?

Mr. Macpherson: This type of aeroplane has not been proved to be spirally unstable. On the contrary, it has satisfied every test by the Technical Comptroller since the formation of the Air Board and by the technical experts of the Royal Flying Corps before the formation of the Board. General Brancker, moreover, crossed the Channel on the first machine of this type to go to France. He saw it tested there also, and it is to-day the type of machine which is used by General Trenear and his staff for their own special work. It is being used with success there, and the Expeditionary Force is asking that the supply may be expedited. In these circumstances, it is not proposed to cancel the orders placed. I am informed that it is not an easy machine to fly, and that it requires the skill of an experienced pilot. I have no knowledge of the refusal of any civilian pilot to fly it, but I think it right to state that some young officers—six, I think—did object to do so. The answer to the second part of the question is in the negative.

MARTINSYDE AEROPLANE COMPANY.

Mr. T. Wilson asked the Minister of Munitions if he is aware that a woman has been appointed to test the measurements of parts of aeroplanes at the works of the Martinsyde Aeroplane Company; and, if so, what qualifications she possesses that fit her for this position?

Sir W. Evans (in a written answer) said: The Company referred to have two aeroplane works. Seven women viewers of the Aeronautical Inspection Department are stationed at one and one at the other. Women have now been employed in the Aeronautical Inspection Department on the examination of aeroplane parts since July, 1915, and have been found satisfactory for the class of work upon which they are engaged. They work under close supervision and have no discretion in the carrying out of their instructions.

ROYAL FLYING CORPS.

On April 4th **Mr. Joynson-Hicks** (by Private Notice) asked the Under Secretary of State for War whether an Order had recently been issued, to come into effect on the 15th inst. that all officers attached to the Flying Corps, to whatever regiments they belong, should now wear the double-breasted flying tunic; whether this will put large numbers of officers and parents to considerable and unnecessary expense; and whether he will cause the Order to be cancelled, or at all events postponed for further consideration?

Mr. Macpherson: An Instruction has been issued, but it will not be brought into operation for six months. It will not be enforced until an officer has been attached for three months, by which time it will be known whether he is suitable for service with the Royal Flying Corps. So far as officers who are posted direct to the Flying Corps are concerned, there is no question of extra expense, as they would purchase the Royal Flying Corps tunic in the first instance. It is not anticipated, therefore, that any considerable or unnecessary expense will be entailed.

Mr. Joynson-Hicks: Then if they are posted to the Flying Corps from another regiment they will not get the tunic for nine months?

Mr. Macpherson: Six months.

EASTER ADJOURNMENT.

On the Debate on the Easter Adjournment, **Mr. Churchill** said:

The last illustration I am going to take of the need of Parliamentary attention being concentrated on these topics is the Air Service. The right hon. gentleman quoted a passage from the Official Report in his speech, to the effect that in March, 1916, there was a Parliamentary agitation on the subject of the better organisation of the Air Service. A strong Committee was formed in the House of Commons of Members of both sides; the First Lord of the Admiralty was interviewed; a debate was demanded, and at last the late Government decided to act, and they quieted this awkward agitation by setting up an Air Board, at the head of which was placed Lord Curzon, a Member of the War Cabinet to-day.

I know the public Departments, and especially the greater Departments of this country well, and I know what their attitude is towards the body which has the opportunity to severely criticise, to offer advice, and to make complaints, and which have not to bear allegiance and obedience to orders. I said, "Perhaps it will not lead to anything effective, and I say quite frankly that it seems to me that it is likely to lead to a first-class row." I am not going to quote my right hon. friend, the Chancellor of the Exchequer, and he may put his mind to rest at once.

The Chancellor of the Exchequer (Mr. Bonar Law): Will you give me the volume?

Mr. Churchill: That was a wholly ineffective and valueless proposal for our protection which created high expectations, and Lord Curzon in the House of Lords made a speech on the subject of the Air Board, treating it as if it was a constitutional, new and International Republic. The House was delighted and entirely satisfied, and that put off the whole question. My right hon. friend made the usual appeal about giving new men a fair chance, and so on, and the topic dropped for four or five months,

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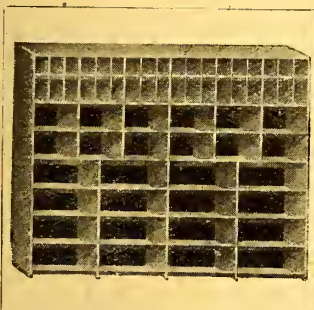
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then it became apparent that what had been expected too long did happen.

The Admiralty had stifled the Air Board, which had been confined to petty and trivial details. There had been no real grip or control of the Air Service, and as I ventured to predict there had broken out a first-class row between the First Lord of the Admiralty and Lord Curzon. Then, as this became an open scandal, when it had become an absolutely open scandal, and feeling that there was to be a first-class row, the Government fell and there was a complete reconstruction.

New arrangements were made, but still half-hearted, still imperfect, still vitiated by most serious flaws of administrative principle, and a new Minister was appointed to have a new and fair trial, and I am sorry to say he has been ill nearly ever since. What I may call the "Curzon" period covered some months of vital consequence to the Air Service, and the results of that period are now manifesting themselves.

We are told that our advantage in machines has passed very largely to the Germans. I cannot say whether that is so, but we are told it is. I do not know how that may be, but I have heard from many quarters complaints to that effect. Certain I am of this, that the inferiority is not due to any defect in our pilots.

There is no more daring class, no more enterprising, no more gifted class of fliers in the whole world, than the heroic young men who represent us at the front. But it is freely stated that they are at a disadvantage at the present time in respect of some of their machines, and certainly the casualties have been terribly severe, and out of all proportions to their numbers, and I cannot feel satisfied that they are in proper proportion to the losses suffered by the enemy. But it is not only the question of casualties at the front, but the very large number of casualties that have taken place during training at the present time.

Then there is the Royal Naval Air Service, which at present and for a long time past has given no adequate fighting return for the enormous number of pilots and the great proportion of material and skilled labour which it has gathered together, and which has been fettering enterprise. Practically no serious effective measures have been taken against the torpedo bases at Zeebrugge, Ostend, and Bruges.

I do not hold Lord Curzon to blame for all these results, because he had not the power. If he had possessed the power I have no doubt the results would have been avoided. But I do blame him for taking the responsibility without proper power and authority. It is a very serious thing for a man in the great situation he was and is in in this country to take up a position like that when, after all, he had not got satisfactory control and authority, which alone could justify him in assuming this very formidable responsibility.

I also blame the House of Commons for relaxing its vigilance, for being so easily put off, for being so easily content to let the question drop without pursuing it and insisting on a periodical discussion of these subjects, many of which no doubt would be much better discussed in private without being reported all over the world. I thank the House very much for having listened to me. I would not have brought these subjects before them if I had not felt that the situation is very serious indeed.

Never at any moment since the victory at the Marne has the situation been more serious than at present. But for the entry of the United States in this war no prudent man could have said that the issue of the war was finally settled, and that the questions which remain were only questions of duration.

Even as it is, there must be a most formidable and oppressive situation before us, and there must be the most vehement effort, the closest co-operation between the Government and the House, and between the House and the nation in the terrible months of war which are coming, more terrible than we have experienced, and it is only by the highest wisdom and the utmost daring and the utmost comradeship that we can come through those strug-

gles safely, and for that great work I am sure the House of Commons would be failing in its trust to the people of England unless it played a constant and active part.

Mr. Bonar Law: I have listened to most of the discussion this afternoon, including the speech of my right hon. friend, with a good deal of agreement and still more of sympathy. The first question which he raised was that in relation to the first Coalition Government, which he described as one of the most disastrous events of the war. I think it is rather difficult to be sure of that. I think that every Member of the House in his own mind should try to make the forecast of what would have happened without it that I had to make before I decided to agree to that arrangement.

The last point raised by my right hon. friend was as to the Air Board. I do not enjoy reading my speeches any more than other hon. Members, but I have looked through this one, and I cannot find any of that optimism in it to which he referred. What I pointed out, and it is as true to-day, was that you had to choose between leaving things as they were, between setting up a compromise and trying to get two Departments to work together, and between establishing a fully-fledged Air Board. Or the three I believed then, and I believe now, any attempt to do the last would have caused dislocation of the Service, and was not the best plan. My right hon. friend says the Board has been a complete failure. I say it has not.

Mr. Churchill: In the intermediate stages.

Mr. Bonar Law: Not even in the intermediate stages.

Mr. Churchill: I never said the present Air Board was a failure.

Mr. Bonar Law: If my right hon. friend could see the difference in numbers and the efficiency of the machines and men we have now, as compared with what they were at the end of the last campaign, he would realise that a great deal has been done. It is much too soon to say that the arrangements have been a failure. I may say for myself there is no branch of the Service in which, from the beginning, I have taken so great an interest, and I say this further, we had plenty of warning of the need for more airships, and we should have been much to blame if we had not done all we could to secure them.

It is quite true that we have not now the ascendancy which we had at the end of the last campaign, and it is true also the same thing was the case at the beginning of the campaign last year. I think the House of Commons would be wise to wait a little before coming to the conclusion that we may not again completely regain the ascendancy which we had at the end of the last campaign.

Mr. Billing: Can the right hon. gentleman look forward to that with confidence?

Mr. Bonar Law: The hon. gentleman puts to me a question which I will answer at once. I do not say that we can. That depends not only on what we have done but on what the enemy have done. I say we have made great improvements, and whether or not they are adequate events only can show.

Somewhere after midnight, and consequently early on April 5th, **Colonel S. H. Greenwood** said: I apologise for rising at this late hour, but I would make an appeal to Members of the House to consider the great inconvenience some of us living at a distance will be put to if we miss our trains. The last train on the District Railway is one o'clock, and I appeal to the hon. Member for East Herts, who is a chivalrous sportsman in a certain sense of the term, and to the Member for North Somerset, not to let us miss our trains.

Mr. King: I never rose!

Sir H. Greenwood: I appeal to the hon. Member for East Herts to have some consideration for those Members who remain. Many of us have supported him in many of his splendid advocacies of the Flying Corps. I ask him to allow us to catch our

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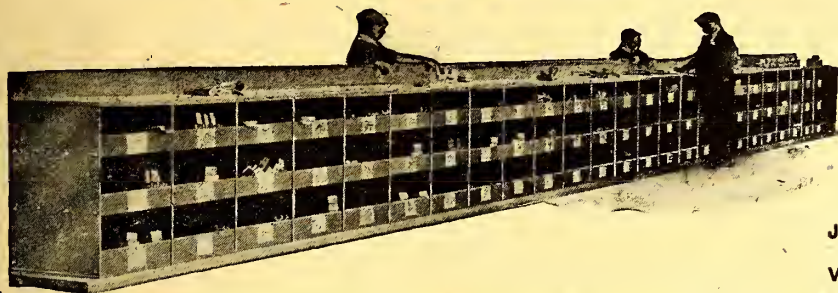


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Mr. Billing: I have a very great and deep appreciation of the domestic advantages of the Members of this House, but I would sooner every Member of this House and every Member of the Government should miss the last train home than one of the best men in this country should be killed by being sent up in a deficient machine. First of all, I wish to say that I must withdraw or rather I must ask this House to excuse me, if at any moment I have claimed the right and the privilege of having stated that some of the best men in this country have been murdered by maladministration. I was looking through the Official Report since the last time that I addressed the House. I am referring to the Official Report of June 17th, 1913. This is what I find:—

Replying to a question by the Noble Lord, the Member for Horsham (Earl Winterton),

"Colonel Seely said that the most careful reports were furnished when an accident took place and he deprecated any suggestion that the officers did not do their work well. From all the information he had it appeared that they were doing their work admirably and the aeroplanes were in excellent condition.

Captain Faber asked whether officers of the Flying Corps did not hold a very different view, and did not some of them hold the opinion that the two officers mentioned (Mr. Harrison and Mr. Desmond Arthur) were murdered by carelessness."

And that is the historical occasion when the word "murder" was first used in the House of Commons in connection with the maladministration of our Air Service. Therefore, whatever reputation I may have gained in this country or in this House for having used the word "murder" in connection with the Air Service, I am afraid I am doomed to lose it. What was the result of that speech?

The Accidents Investigation Committee of the Royal Aero Club, upon whom Colonel Seely placed reliance, issued a Report on May 19th, in which they state:—

"In view of the fact that aircraft are built of perishable materials, the Committee strongly recommends that those which have been in existence for some time, whether they have been in use or not, should undergo a critical examination both as regards their framework, and the fabric, with a view to ascertaining to what extent deterioration has taken place, and the conditions of the aircraft generally recorded at the time."

"The Committee is of opinion that the primary cause of the accident was the failure of the faulty joint in the repair to the rear main spar. The Committee is further of opinion that the repair referred to above was so badly done that it could not

possibly be regarded as the work of a conscientious and competent workman."

That Report has a very peculiar significance. When I had the honour, if not the pleasure, of appearing before the Committee specially appointed by the late Prime Minister—as I had occasion to say before, I did not have the opportunity of appointing my own judges in this case—when I tell you that I brought up that very case as an instance of maladministration and criminal negligence, tantamount to murder, what was the result? The Committee came forward with an Interim Report, which I hold was a political manoeuvre—a political manoeuvre by a discredited Government to discredit a critic—and said: "We have no reason to believe that there was a patch or repair on this aeroplane, and we do not believe a word of what Mr. Pemberton-Billing has said." Yet I read them this actual report, and they would not believe it because I was unable to obtain a copy.

I listened with considerable interest to the right hon. gentleman the Member for Dundee (Mr. Churchill) to-day. I listened to the queries he put forward, and to the statements he made as to the condition of our Air Service to-day. I was interested, but I cannot say that I was surprised. The right hon. Member, with all his faults, and I am quite sure that this House is not blind to them, possesses more originality of mind and more imagination than most Members of this House, and if I ever presume to give this Government advice on any point of its administration, I would suggest that if they are seeking—and I hold no brief for the right hon. Member—for a man whose wealth of imagination could be turned to a useful purpose to-day, whose vision, at least so far as aeronautics are concerned, is not prevented by politics and carries him beyond the Front Bench, they might do worse than to ask the right hon. gentleman to handle the question of our Air Service with a firm hand to-day.

To-day the Air Service is in a state of flux. We are told that an Air Board would be appointed; that it would prove the salvation and solution of this great problem which has been dismissed as an incident in this war instead of being recognised as what it may ultimately become, if this war lasts long enough—and it will have to last some time longer if we are going to dictate terms to and not listen to terms of peace from our enemies—the deciding factor in the terms of peace.

As regards all the actions of the present Government I have supported them in the Lobby, and I shall continue to do that. I am afraid that one vote is not a matter of any great assistance, but so long as their policy is for the successful prosecution of the war and makes for the efficiency of both our Air and our Sea and Land Services I shall give them my whole-hearted support.

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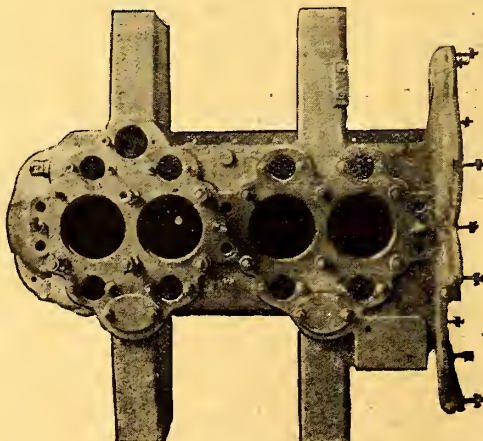
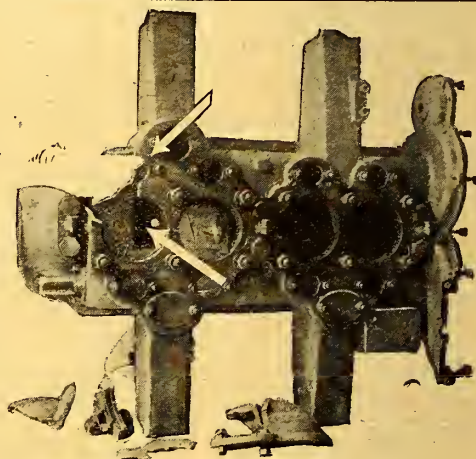
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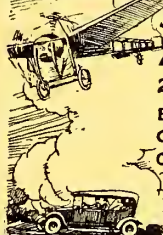
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I regard my peculiar duty in this House to give effect as far as possible to the mandate upon which I was sent here. The mandate I received was to endeavour to put our Air Service into that state of efficiency which would make it capable not only of maintaining its position, but of improving it, and of ensuring to this country the supremacy of the air.

In March, 1916, our losses at the front seemed to those of us who were studying the problem closely one of the most serious incidents in this war. It appeared to us all the more serious because it was not a question of numbers. The proportionate number of pilots who were being killed was not so serious in relation to the terrible losses we were sustaining in other branches of our naval and military forces. I know that when I have put forward in this House the argument that 30 or 40 of our pilots have been killed it has been remarked to me, "After all, what is that to the thousands who are being drained away daily in our military operations on the Western front, to say nothing of our operations in other parts of the world." But what we have to remember is that the training of a pilot for the purposes of observation and air fighting—and without first-class air fighting pilots we cannot retain the observation pilots—is not only a very difficult but a very long task.

The matter is much more serious than hon. Members of this House appreciate. The matter is so serious, Sir, that if this Debate degenerated into a heart to heart talk between yourself and myself I should continue. The position is this, that if we go on losing pilots, first-class pilots, at the rate we are losing them to-day, the day is not far distant when we shall have no first-class pilots and no first-class observing pilots.

It means that our Army on the Western front will be blind, and if our Army is blind, we are beaten. If our Army is blind we are at the mercy of the manoeuvres of our enemies: we are at the mercy of their guns, and our own guns, which, for the last two years at least, have absolutely relied on the information supplied to them by the gun-spotting machines, would have to fire blind into the enemy's lines, and would be throwing away all those wonderful munitions which we are making a gigantic sacrifice in this country to produce. I cannot understand how any Member of this House who possesses enough intelligence to come in out of the rain to save himself from getting wet can fail to see the possibility and the necessity of our Air Service to-day.

That is the only justification I have for continuing my remarks as to the position of the Air Service to-day. It is more serious and more critical—I am now referring to the Royal Flying Corps—than it was twelve months ago, because the position of the whole of our fighting forces is more critical. We have a bigger Air Service, we have more pilots in the air, we have more aeroplanes at our disposal. But you must remember that twelve months have passed since then, twelve priceless months; millions of bullets have been fired, hundreds of thousands of lives have been lost, and still we are pondering, still we are intriguing, still we are hesitating, and when I think that since I first stood up in this House to raise this question dozens of men, dozens of the most priceless men this war has produced, personal friends of mine, have been killed, it is difficult to speak without passion.

Mr. King: Though I have never agreed with the hon. Member for East Herts, I feel now that it is a great loss to the House that he had not a full House to listen to him. I also greatly regret that there is no Minister here to reply, but I am perfectly sure that what the hon. Member has said will be read in the Official Report and will receive due consideration.

[Adjourned at twenty-nine minutes before two o'clock.]

ANCIENT OPTIMISM.

The writer of the "Office Window" column of the "Daily Chronicle" gives the following account of early German endeavours, which is not without interest. The jibe at German optimism is, however, hardly merited, when it is remembered that the Germans hold the world's distance and duration records both for aeroplanes and airships.

Mr. Fokker's boast that his aeroplanes will be able to cross the Atlantic—after the war—in a day and a half proves the Germans to be incurable optimists of the air. The London "General Chronicle" of 1811 recorded the adventures of a number of pioneers. At Berlin, Claudius, a manufacturer of oilcloth, is said to have risen easily on his wings, "moving in a direct line at the rate of four miles an hour," but as the wings were unwieldy he could not turn round upon them.

Another, a tailor of Ulm, engaged to fly in public a distance of twelve miles. "From later accounts," says the "Chronicle," "we learn that he has been unsuccessful. He placed himself upon the walls of Ulm, at the edge of the Danube, for the purpose of flying over the river, but no sooner had he leaped from the wall than one of his wings broke, and fell into the water, and he must have been drowned had not some boats gone to his assistance."

[Owing to pressure of space, "Answers to Correspondents," "Scenes in an Aircraft Factory," and other items of interest have been, perforce, held over till next week.—Ed.]

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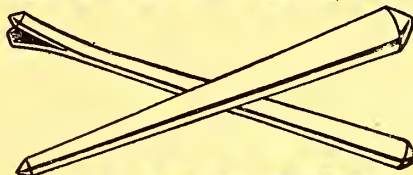
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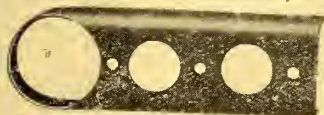
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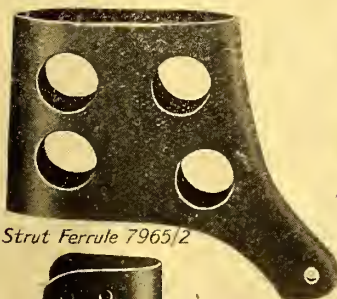
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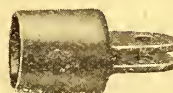
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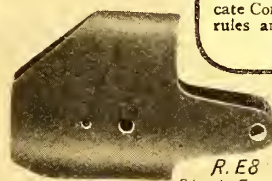
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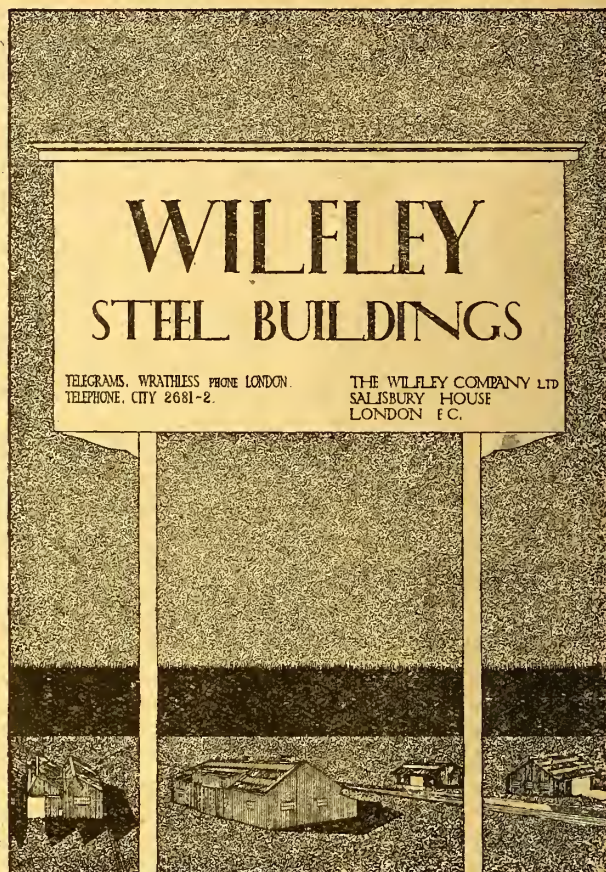
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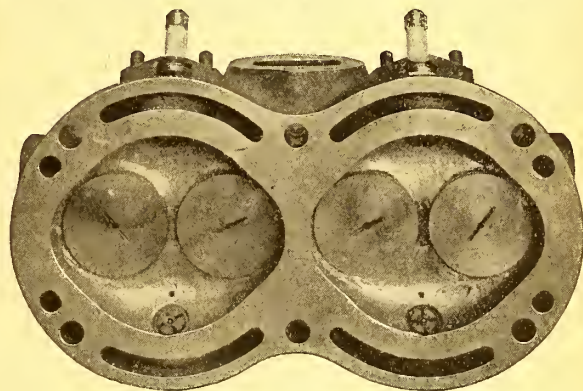
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Many years ago, as I remember, there was a dark-skinned gentleman who described himself as a "brother citizen of the glorious British Empire," though my outspoken Anglo-Indian friends used to call him a Babu. This gentleman had the genius of his kind for mixing epithets, and was apt to confuse the phrases "full-blooded" and "in full blast," with the result that, wishing to be particularly complimentary on one occasion, he addressed a distinguished personage, to whom he was introduced, as a "fool blasted Englishman." The consequence was lamentable, but the phrase passed into circulation.

Apropos which, those who know the breed and admire its many high qualities have to recognise the fact that the "fool blasted Englishman" is curiously single-minded, not to say a person of one idea, and finds it difficult to realise that a thing may be partly very good indeed and partly abysmally bad. Being by nature a hero-worshipper, an attitude of mind derived from his pagan Teutonic ancestors, who lacked the all-comprehending mysticism of the Celts whom they drove out, the Englishman requires that his idol shall be of solid brass throughout.

If you tell him that his idol has feet of clay, he probably tries to slay you for blaspheming. If you survive the slaying process and finally convince him that the idol has got feet of clay, he probably destroys the whole thing, which is a waste of valuable material, especially in war-time. It is almost impossible to make him understand that you regard the idol as a perfectly good idol, so far as it goes, and that, if only he would have the sense to jack it up carefully, remove the clay, and replace it with skilfully made feet of the best heat-treated steel, it would be a better idol than the other fellow's, which is probably too rigid and solid to stand an earthquake.

THE PRINCIPLES OF HIERARCHY.

As soon as you point out the clay feet, he accuses you of saying "bloomin' idol made of mud"—to use Mr. Kipling's elegant phrase—or something equally rude. And naturally the High Priest of the Idol encourages him to stone and crucify the blasphemer, because, if shock-proof, non-rusting, everlasting feet were fitted, there would be no need for so many lesser priestlings to tend the idol's feet, and to go round looking for flaws with microscopes, putting up the cracks, testing in sacred instruments the new clay required for repairs, doping the surface with strange unguents, inscribing mystic signs on papyrus, and performing other weird antics.

And there would be no need for advisory scientists to explain in scientific shibboleths why the idol was out of plumb, and how good it was that it should be out of plumb. And if all these priestlings and deputy-

priestlings and acting-sub-assistant-deputy-priestlings were not there, some of the upper-priests would not be so far up, but might have to do tweenie-priests' work, and then their sacerdotal garments would merely be decorated with a few of the sacred pips, and they would not be entitled to appear before the worshippers of the idol in helmets of bronze.

For one of the first principles of a hierarchy is that the greater the number of minor priestlings the more important is the High Priest, and those his vicars immediately below him. For which reason, if an earnest priest desires one capable assistant worthy of high emolument, such an assistant is refused him; but if he wishes for a dozen or more mere clerks or scribes of little worth, they are forthwith allowed to him, for thereby his office is exalted and the offices of those above him are exalted still further. And, as Mr. Kipling says, "This is very sad, but so it is."

THE MISSIONERS.

And the curious thing is that, while all the big priests and the little priests are dancing before the idol in the sacred courtyards and temples and decorating themselves with jewels and gauds that they may appear beautiful before the worshippers of the idol, who incidentally pay for the upkeep of the temples and their attendants, the missionaries of their faith may be labouring earnestly in evil places abroad and in unpleasant places near home that those who believe may fight the good fight.

In dismal slums, amid whirling machinery, on bleak, hedgeless and treeless plains at home, on snow-swept plateaux, on burning deserts, over rocky peaks, in miasmatic swamps, on tropical rivers and lakes, and amid constant enemy attacks in far countries, the missionaries of the faith may continue their work, knowing well of the feet of clay, but knowing, also, that the upper part is sound, and hoping that some day a new High Priest may arise who will remove the old hierarchy, and will apply modern engineering methods to the support of the idol, which may be in truth the finest idol in the world. But it is so sad that people will insist on confusing the priesthood with the religion.

All of which has nothing to do with flying, of course, only somehow active-service aviators and the people at home who have the arduous job of training young aviators for active service always remind me of the Jesuit Fathers who bravely carried their faith into the heart of Asia and the depths of American forests, and did their good work in little missions among the slums of European cities, regardless of personal danger and physical exhaustion. So perhaps for a change from everlasting criticism one may tell a few tales of flying on active service, derived at second hand from hearsay, but none the less probably true in the main.

ON THE WESTERN FRONT.

Somewhat one comes to regard the Western Front as the most exciting from the aviator's point of view, though there is much to be said for other theatres of war. True, the pilot and passenger of comparatively slow-flying, slow-climbing machines, out on what I believe are familiarly called Artobs, or artillery observation, and "spark-crawls," otherwise watching for the flash of enemy batteries, have a fairly strenuous time when assailed by Hun Archies from below and by faster Hun aeroplanes from above; but if they escape being hit, they have probably a comfortable billet awaiting them when they come home, and a sporting chance of being treated honourably as prisoners of war if their engines let them down on the wrong side of the lines.

On the other hand, they are free from the prospects of being left in Soudanese deserts to die of thirst, or of being eaten by lions, or trodden upon by rhinoceroses in Central African bush, or of being massacred by Arabs in Mesopotamia, or of being cut up by Afridis on the North-West Frontier of India, or of being left to die of cold on some inaccessible Balkan peak. Everything has its compensations in this life. So perhaps one may talk about the Western Front first.

THE TACITURN AVIATOR.

Those who do the most flying talk about it very little. As the late Wilbur Wright said, "The parrot is the bird that talks most and flies least." The members of the Flying Services who talk most are the "'I,' said the fly, 'with my little eye'" people who squint down wind tunnels and microscopes and test tubes and things, and delight in telling all about what they saw, and what they think they can teach other people about it all, regardless of the fact that the other people produce real aeroplanes while they are talking. The real active-service pilot is the last person in the world to talk about his own achievements, though when one can get him in the right humour he is free enough in telling about what other people have done.

That is the curse of the present day. Until a hundred years or so ago, the nation was led by the people who did things. The aristocracy of the period was descended from men who arrived at the top by the simple physical process of killing those who disagreed with them.

To-day, with our system of government by election, we are led by mere talkers. To win votes a man has to be a talker. The man of action can hardly ever talk, and the glib talker can hardly ever act. Hence the House of Commons and the general misconduct of the war.

Nevertheless, when the active-service pilot can be induced to open his mouth, his talk is good talk. If one believes his account of his own doings, he divides his time fairly equally between lounging idly in his billet, playing frivolous or deleterious games of chance, and amusing himself vainly in the nearest big town. Occasionally he spends a while in being horribly frightened over the enemy's lines. And all the while he bulges with admiration of what his friends do while in the air. Which account does not fit in, on occasion, with sundry Military Crosses, and D.S.Os., and foreign decorations which such self-accused idlers wear in many cases.

Therefore, when one wishes to get at the truth about some innocent-seeming young person with a string of ribbons which belie his obvious youth, one asks someone else what his squadron thinks about him. It is also possible, when one has had some experience of the mental processes of the active-service pilot, to arrive fairly near the facts by adding some hundreds per cent.

interest to his account of his own doings, and knocking a small discount off his stories about his friends.

THE HOT-AIR MERCHANT.

Here and there one comes across one of the kind vulgarly known in the language of youth as a "hot-air merchant." Frequently he is amusing, but never reliable, and the remarks of his contemporaries on his stories are generally terse and to the point. I remember retailing some yarns by such a one to a youngster whom I knew to be a real aerial scrapper, on which the genuine article's comment was: "I know the sort of chap. They come out after about five minutes in the air, and go machine-gunning German generals and their staffs on the open road from fifty feet up, and they have a wonderful knack of killing the passengers on Hun single-seaters."

The sarcasm of the latter remark may be appreciated by the uninitiated when they learn that a single-seater carries a pilot only, and that the job of passenger is analogous to the position of line-man in a wireless telegraph company. However, on this occasion we may neglect the stories of hot-air merchants, and stick as nearly as may be to the genuine article.

THE SELF-CONFIDENT HUN.

We have heard a good deal of late about the immense speed of some of the later German aeroplanes, and it has even been admitted officially that some Hun machines are faster than some of ours. One may assume that the Hun pilots know it also, and it appears that they are rather apt to presume on the fact, occasionally to their own undoing. Here is a case in point.

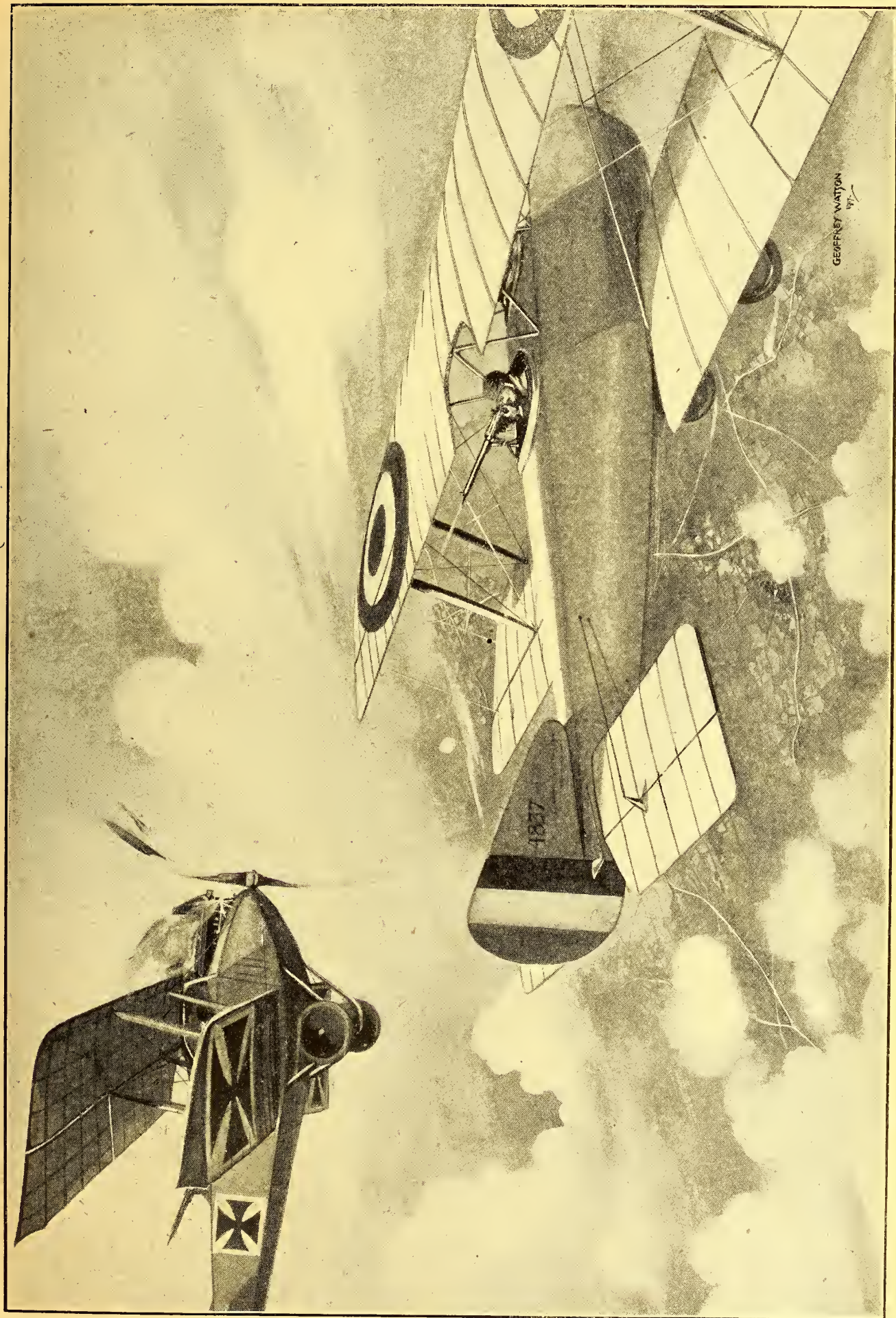
It is always the custom of the fighting pilot on a fast machine to dive under his enemy's tail and fire straight along the fuselage, for he thus has a chance of hitting the pilot, or the passenger, or the tank, or the engine, while himself protected by the tail of the machine which he is attacking. The gunner on a "pusher" machine cannot fire directly aft in any case, because of his propeller, and even in a "tractor" with the gunner behind, a position first introduced by the Germans, it is possible for a clever pilot to get into a position behind and under the tail where the pursued gunner dare not fire at him for fear of blowing his own tail or control-wires to pieces.

In this particular instance one of the very fastest Huns attacked a British machine in which the gunner sat aft of the pilot, and pumped lead into it vigorously without hitting anything that mattered. The gunner replied as best he could, and emptied one drum of a Lewis gun at the German.

As he was getting up a second drum he dropped it into the bottom of the cock-pit. Whereupon he disappeared into the body of the machine just as a surprised rabbit disappears into its hole. The Hun, seeing him thus suddenly vanish, concluded that he had been hit, a somewhat natural assumption, justified by the fact that the gun was left with its nose cocked up aimlessly in the air, swinging on its pivot as the machine swerved.

Having his enemy thus at his mercy, the Hun opened out his big engine and ploughed up alongside the pilot, who was, of course, unable to retaliate with his fixed gun in front. Throwing up his goggles and looking fierce, the Hun pointed imperiously to the ground, signing to the British aviator to land and surrender.

The pilot, looking round and finding that his gunner had disappeared, also assumed that he had been hit, and was just considering how he could best manoeuvre so as to bring his fixed gun to bear on the enemy, when up popped the gunner, having retrieved his drum of ammunition.



AN EASY MARK.—By a curious coincidence this picture, which presents to the average active-service pilot a position which seems almost impossible, was drawn just about the period at which the incident related on the following page actually occurred.

To his joy, the gunner found himself staring at the ever-prayed-for and never-before-seen target of a Hun machine, broadside on and about fifty feet away from him. This time he made no mistake about getting the drum on its pin. There was one burst of fire, which raked the Hun from end to end, and over he went in that unmistakable twisting dive which is only made by an aeroplane out of control.

After which the British machine went off to look for more trouble.

A CURIOUS COINCIDENCE.

Apropos this story there is a curious coincidence. Some time ago, Mr. Geoffrey Watson brought me the picture which appears on the previous page. Owing to lack of space, it was not published, and it has been in my possession for some time. One day I happened to show it to an aviator who has done a good deal of air fighting. He remarked that it was a capital picture, full of life and all that, and well drawn. "But," he added, "one doesn't get a chance of a broadside shot like that. The wily Hun keeps under one's tail all the time, if he ever gets there, so what's that fool doing where he is?"

Some days later, several of us were talking about air fighting, and one of the group told the story of the self-confident Hun, just about as I have told it, the adventure having happened to someone whom he knew quite well. So there it is, more or less correctly illustrated, with the peculiarity that the illustration was drawn just about when the affair occurred.

As curious a coincidence is concerned with another picture by another artist, which I hope to publish at a later date, a personal experience having been put into a story by an aviator, and the artist having drawn the perfect illustration for it, without either knowing of the other's existence.

WITH COLOURS FLYING.

There is a weird mixture of tragedy and comedy in a story told by a pilot from a fighting squadron. The story was extracted through someone else remarking casually on how one catches a glimpse of some scene quite outside one's own business in a moment of stress, and how that scene is photographed on one's memory.

This particular pilot was out on a protection patrol, guarding sundry gun-spotting or photography machines not very far over the enemy's side of the lines. He and his convoy were getting along quite nicely with their job, when they were attacked by a number of Hun chasers, which appeared suddenly from up above. One of the most pugnacious Huns went for him with considerable skill and energy, and kept him very busy for some time.

After what appears to have been, according to his account, a thoroughly enjoyable scrap, he polished off the Hun to his own satisfaction, and promptly dived to the help of the slow machine below. He found it surrounded by enemies and apparently having a very bad time.

As he plunged into the thick of the Huns, he caught a glimpse of the British machine gliding steadily for its own lines. A couple of Huns were on each side, pumping bullets into it for all they were worth; the observer was hanging helpless over the edge of the front cock-pit, and the propeller was stopped, indicating either engine failure or a hit in a vital part of its economy. The pilot, having seemingly exhausted all the ammunition from his own gun, was sitting bolt upright in his seat, his right thumb to his nose with the fingers spread out in direction of the Huns on the right, while with two fingers of his left hand extended

upwards and outwards he made the insulting sign commonly known as "the Devil's pitchfork" to the Huns on the left.

Somehow, in the absence of the pomp and circumstance of Naval warfare, the picture which the story conjures up to one's mental vision is almost an adequate equivalent to a game little ship going down before superior forces with her colours flying.

So far as I could learn, the pilot brought himself and his poor old machine safely to earth, with nothing worse than a damaged leg for his share in the fray, but the observer was already dead when he landed.

WHERE THE HUN SCORED.

The Hun also can, on occasion, show his scorn for his enemies, as a slight experience of another fighting pilot shows. He and sundry others on single-seaters were out in search of trouble, when they espied an unsuspecting German below. They all dived for him at once, and the first warning he had of their presence was a young hailstorm of machine-gun bullets round his ears. Two of the British machines side by side dived for the tail of the Hun, who was on a fast single-seater, whereas their mounts were not of the newest.

He waited quite calmly till they were quite close up behind him. Then he turned round, grinned, put his tongue out at them, opened his engine out wide, sat on his tail, and went up like a rocket at a pace which not one of the British machines could touch.

That was at a time when fast German machines were not as common as they are now, so probably a similar occurrence would not be quite so surprising to-day as it was to the two pilots in question.

THE IMMELMANN TURN.

One does not associate the big two-seater German machines with aerobatic feats, but it appears that they can do queer things when they try. Some of the Fokker pilots used to be fond of getting out of trouble, after the de Havilland single-seat fighters arrived to worry them, by doing what our people called the Immelmann turn, because for some reason or another the famous German pilot was credited with having invented it.

The trick consisted simply in flying along straight, then putting on full warp and opposite rudder, so that the machine came over to a vertical bank without turning off her course, and then letting the machine fall over flat on her back. After a moment upside down, the nose would drop, the machine would dive vertically, and on being pulled out of the dive would come out facing exactly in the direction opposite to that in which it had been flying, and somewhat lower down.

Some time ago two of our fighting machines of a very good type, but a type which was more fit for first-class fighting a year ago than it is to-day, found a big Hun two-seater below them and dived for his tail. The gunner in the after cock-pit saw them coming, and let them have all he could give them. Carried along by the speed of their dive, the British machines actually went faster than the Hun at first, and the pilot, evidently thinking that he had struck something strange, suddenly warped his great big machine, gun, observer, and all complete, flat over onto its back, where for a moment the British pilots gazed in surprise at its wheels. Then down went the nose, and before they had time to turn, or do anything useful, the Hun was away underneath and behind them. By the time they had turned he was above them and climbing hard, so they never had another chance at him.

A trifle disappointing to pilots who rather fancied themselves as Hun-strafters. But it showed them, at any rate, that the Germans are not afraid of top pressure on their big biplanes. The machine must have been

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fairly solidly built to have stood up to its full load when turned upside down in this way, for this manoeuvre is a very different thing from a clean loop, in which the load is taken on the flying wires all the way round the loop if properly done. Anyhow, the performance increased their respect for German construction.

THE PERSONAL NOTE.

The young aviator on the West Front has little enough respect for most things in heaven above or on the earth beneath, but there is one person whom he does respect heartily—namely, the General Officer Commanding R.F.C. in the Field. What Sir Douglas Haig is to the infantryman, General Trenchard seems to be to the young R.F.C. pilot, and it is a very healthy sign.

One expects as much from the older hands in the R.F.C. who passed through the Central Flying School, when Major Hugh Trenchard was assistant-commandant, for they were in close touch with him, and learned that however brusque his manner might be, and however severe his orders might seem, their own welfare was his foremost consideration. But one scarcely expected to find the same combination of affection and respect for their G.O.C. among all the hundreds of youngsters, most of whom can hardly have seen him or spoken to him.

Pilots who have seen really hard service on the West Front are prepared to criticise most things and most people. Aeroplane designers, especially the official breed, come in for plenty of it. Colonels and Brigadiers are not as sacred as we were taught to believe them to be in our youth. But whatever the G.O.C. R.F.C. orders or does seems to be right in their eyes, and his glory seems to be reflected onto his Staff, for one hears

hardly any of the grumbling about R.F.C. Staff work that one used to hear about the Army Staff work before the Great Push. Which is as it should be.

So long as the soldier in the field trusts, and has good reason to trust, his leader in the field he can carry on. Our men in the Crimea won through, despite bad food and rotten boots. The R.F.C. has won through in this war, despite mistakes, unforgivable mistakes in many cases, in the design and supply of its machines, because during its most critical period it has had a leader in whom it had implicit trust. It still has implicit trust in him, and with the best of reasons.

During those bad periods, when superiority in the air has been greater on the German side than ever it ought to have been, even allowing for that "swing of the pendulum" about which official apologists are so fond of talking, General Trenchard's organising power has met the Hun offensive with undefeated vigour, and he has kept up the spirit of the R.F.C. when many a good and able man, lacking his energy, would have failed. The work of the Corps has had to be done, and he has seen that it has been done, at as low a cost as possible with the material available. The pilots know that he has done wonderful work under great difficulties, and that the welfare of the people who do the flying is second only in his mind to Sir Douglas Haig's requirements from the R.F.C. as concerns such things as reconnaissance, artillery observation, and contact patrols.

One perceives, then, that the R.F.C. in France is in a happily healthy state, and is always ready, when suitable machines are available, to resume in fact that "dominance in the air" which home-staying officials would have us believe came into existence through their genius and has never at any time been lost.—C. G. G.

A MEMORIAL TO THE LATE HORACE SHORT.

In the "Morning Post" for April 14th, Mr. Massac Buist, who has too long refrained from writing on aeronautical affairs, makes the very sound suggestion that the Aircraft Industry should institute some form of permanent memorial to the memory of the late Horace

Short, and I desire herewith to add my advocacy to the suggestion.

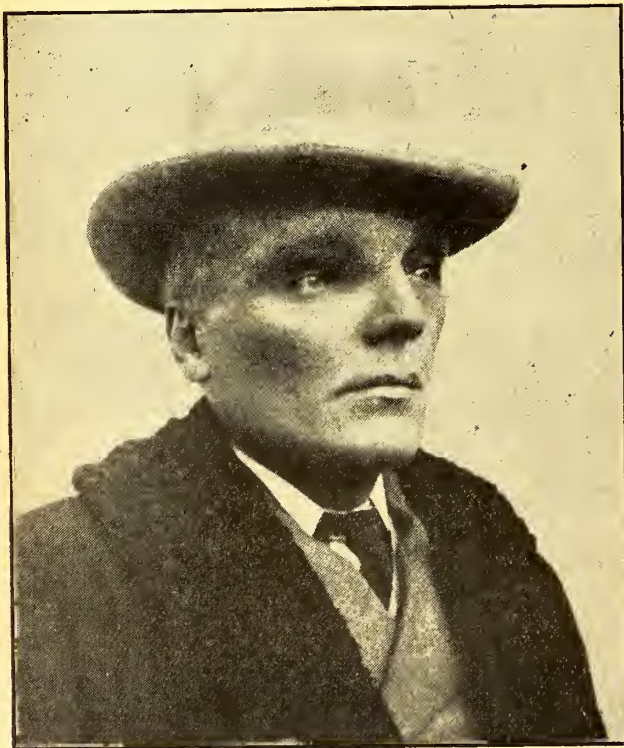
Mr. Short was eminently a practical man, so I imagine that he does not desire a marble monument or a brass tablet or any of the ordinary substantial memoranda of commerce. Therefore I venture to suggest that the most fitting memorial would be an annual reward for someone who has done something to improve the type of machine in which he was most interested—namely, the seaplane.

The memorial might be a scholarship at one of the senior Universities, awarded for the best thesis on seaplanes—the award to be made by the Council of the Aeronautical Society. Or it might be an annual cash prize for the best invention for the improvement of seaplanes patented during the year, or submitted without patenting—the award again to be made by the Council of the Aeronautical Society. Or—as we already have the Wilbur Wright Memorial Lecture—we might conceivably have a Horace Short Memorial Lecture, the subject-matter being confined to seaplanes. Doubtless there are many better suggestions, but as a basis of discussion I submit these to the Aeronautical Society and the Society of British Aircraft Constructors.

In any case, one who has done as much as Horace Short has done for aviation—especially for sea flying—deserves a permanent memorial which will keep his memory alive in future generations. We who knew him need no reminder, but we owe it to him that he shall be made known to those who follow us.—C. G. G.

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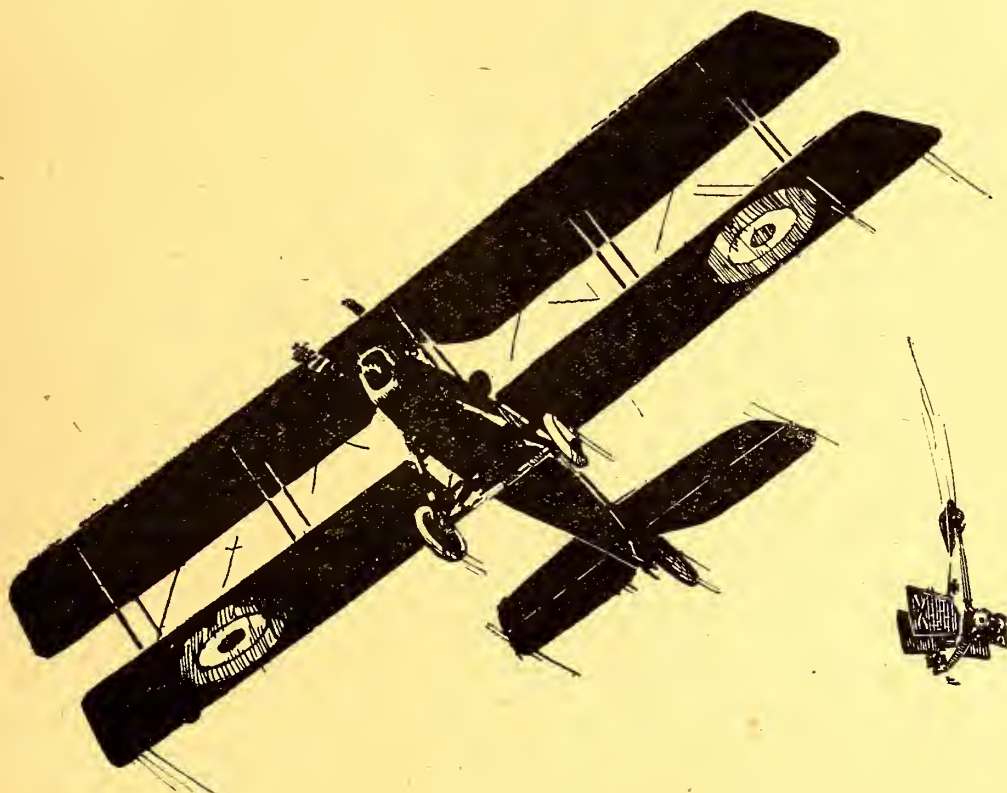
A meeting of the Council of this Society will be held on Wednesday, April 25th, at 4 p.m., in the Library of the Aeronautical Society, 7, Albemarle Street, W.1.



The late Horace Short.

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THE KING'S APPROVAL.

By appointing himself Colonel-in-Chief of the Royal Flying Corps (Naval and Military Wings), as notified in the "Gazette" of April 16th, His Majesty the King confers a well-earned honour upon our active-service aviators. Under all disabilities of numbers, equipment, and adverse conditions of wind and weather, in all parts of the world, the officers and men of the R.N.A.S. and R.F.C. have upheld the best traditions of the King's Armed Forces as concerns gallantry and devotion to duty. The seal of Royal approval thus set upon the work of our aviators should encourage, even if it be impossible to increase, the high spirit and unshakable moral of both the Flying Services.

Those in high places who endeavour to burke criticism of their own faults by pleading that exposure of the truth has a deleterious effect on the moral of our aviators have been given the lie direct by the work of the Flying Services throughout the war, and never more so than by the unflinching determination with which the R.F.C. and its protecting squadrons of R.N.A.S. fighting machines have done their work in the Somme and Arras areas. The King's approval will be received by both Services as a welcome reward for work well done.

WELCOME APPOINTMENTS.

The appointment, gazetted this week, of Brigadier-General W. S. Brancker to be Deputy Director-General of Military Aeronautics will be genuinely welcomed, not only by the R.F.C. itself but by all who have the welfare of the R.F.C. at heart.

As an active-service pilot in the early days of the war, and as a commanding officer in the field, General Brancker won the confidence of all who served under him and with him. As Director of Air Organisation during more recent stages of the war he has won general admiration by the ability which he has displayed as an administrator, and at the same time he has increased the confidence which the R.F.C. has in his choice of men and aeroplanes alike.

The high efficiency reached by the R.F.C. under General Brancker's scheme of organisation is shown by the remarkable results achieved in the Battle of Arras. The taking of 1,700 photographs in a day over one sector of the line alone, and the capture of over 150 guns, a large proportion of which are stated to have been knocked out by our own artillery, thanks to R.F.C. spotting, is a great achievement, especially when one considers certain limitations of *matériel* to which it has been necessary to refer at times in these pages. Be it said that wherever General Brancker's choice of aeroplanes has been apparent no such limitations have been observed, and it is evident that the organisation at home which provided the G.O.C., R.F.C., in the Field with a personnel capable of achieving the Arras results must be of a very high order.

Efficiency before all has been the rule of the R.F.C. ever since General Brancker took control of the organisation, and the state of efficiency demonstrated during these past weeks is worthy of the Royal Regiment of Artillery, in which General Brancker served until he diverted his abilities to flying.

It is curious at this date, after almost six years, to look back to the early days of military aviation, when the embryo R.F.C. consisted of No. 1 Aeroplane Section of the Air Battalion R.E., and to find that in those distant days one was advocating the Gunner Officer as the type of man needed to develop military aeronautics, because the infant Flying Service was in danger of being smothered by the combined attempts of politicians and sappers.

The esteem in which General Brancker is held by all ranks in the R.F.C. is best proved by the fact that the



Photograph by Elliott and Fry.
Brigadier-General W. S. Brancker.

only thing one ever hears alleged against him is that he is too fond of flying. Truly a strange objection to be raised by active-service aviators, one of whose grievances in the past used to be that senior officers did not fly, and so did not understand the needs of the R.F.C. at the front. But the objection in this instance arises from a wholly laudable fear lest by one of those unavoidable and unforeseeable accidents to which the best of aeroplanes are liable the R.F.C. should be deprived of the leadership of an officer in whose judgment and ability the Corps places implicit faith.

It is to be hoped that General Brancker's immunity from accident may continue, so that in due course his present appointment may lead to still greater developments in the R.F.C., and still greater responsibilities with accompanying promotion in substantive rank for that officer himself.

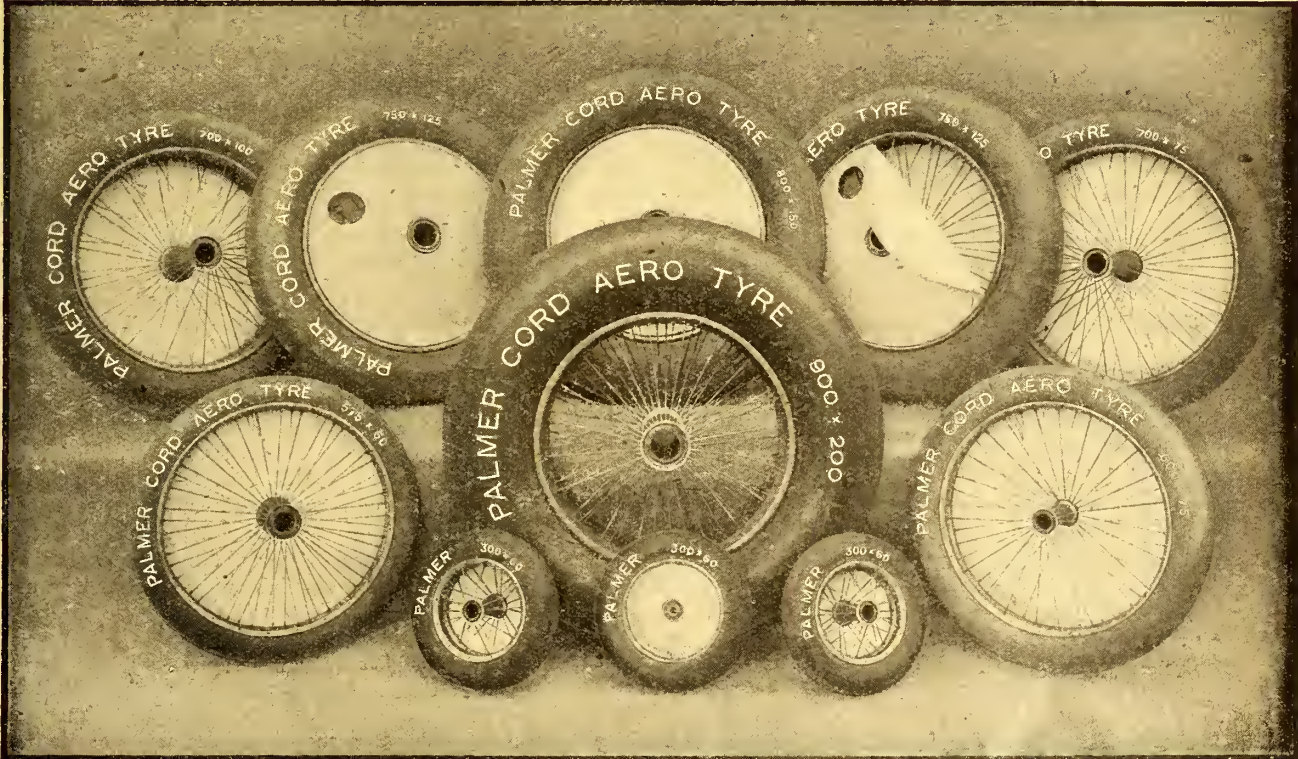
The appointment in the same Gazette of Lieut.-Col. L. E. O. Charlton, D.S.O., to be Director—presumably Director of Air Organisation—with temporary rank of Brigadier-General, will be equally welcome to those who know anything of the work he has done since he returned from active service. Colonel Charlton, then a captain, and already a D.S.O., was one of the first R.F.C. officers to fly over the German lines in the first week of fighting, and he was credited among the original officers of the R.F.C. with being the first to read aright the movements of the advancing German troops, for which reason he was regarded as having given the information which actually saved the British Expeditionary Force from being overwhelmed.



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450 x 60	30	89.	31.75	Central	"	91	178.	31.75	132/46	"	96	178.	55.	132/46
575 x 60	14	150.	38.09	104/46	700 x 100	2	185.	55.	135/50	800 x 150	8	185.	55.	135/50
"	21	160.	28.	Central	"	4	185.	55.	Central	"	10	185.	55.	Central
"	34	150.	31.75	104/46	"	18	178.	44.45	132/46	"	36	185.	55.	135/50
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"	20	178.	38.09	132/46	"	33	150.	38.09	Central	"	42	185.	60.32	125/60
"	75	178.	31.75	132/46	"	66	178.	38.89	132/46	900 x 200	47	185.	55.	125/60
600 x 75	14	150.	38.09	104/46	750 x 125	2	185.	55.	135/50	1000 x 150	97	250.	65.4.	Central
"	21	160.	28.	Central	"	4	185.	55.	Central	1100 x 200	52	185.	55.	116/69
"	34	150.	31.75	104/46	"	18	178.	44.45	132/46	"	57	185.	55.	Central
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Be that as it may, his promotion to commands of increasing importance was rapid, and his appointment to his late work at the War Office was welcomed by all active-service pilots, who foresaw the benefits to come from having an officer with knowledge of active-service conditions in the position which he held. Their satisfaction on that occasion will be increased by his present promotion.

With General Trenchard in command in the Field, General Brancker in charge of affairs at home, and General Charlton carrying on the work of organisation, all will feel greater confidence in the ability of the R.F.C. to gain and hold permanently the Command of the Air, which it is not only possible for this country to obtain, but is absolutely necessary to maintain, for the future safety of the Empire.

TRAINING.—XII.

BY "BERKELEY."

The international rules controlling the treatment of sick and wounded in the theatre of war are those laid down at the Geneva Conventions held in 1864 and in 1906. In some matters the two Conventions have fundamental differences, and in consequence the findings of the former are adopted in the military practice of some nations, and the findings of the latter are exclusively adhered to by others. In effect the later Convention is an amplification of the first, and some provisions dictated by the obvious needs of war. The emasculation of war tends only to its infinite lengthening and to the accentuation of ultimate horror. The greater the intensity in war the shorter the duration and the more definite the result.

RESPECT FOR HOSPITALS.

Military hospitals and personnel directly and solely concerned in the sustenance and treatment of the wounded are given special protection under the Geneva rules. They fly the distinctive flag, a red cross on a white ground in the case of Christian nations, and a red crescent on a white ground for Mahomedan races, accompanied by the national flag of the belligerent of whose forces the medical units are a part. The personnel engaged are similarly distinguished by a red cross armlet or badge. But the red cross flag may not be hoisted over hospitals not under military control, nor without direct military authority. Hence the disappearance of the red cross on the labels of many medical necessities sold in this country. It is a military symbol exclusively.

The personnel of private societies engaged on hospital duties count, if so authorised, as part of the military medical establishments, and are entitled to the specified protection and recognition.

Naturally, if any one of the authorised medical units is used for purposes harmful to the enemy, the protection accorded by international agreement ceases to be effective. The coincidence of an ammunition dump and a dressing station under the shade of the red cross flag is not regarded with favour by an active enemy. The foundation of an information bureau of belligerent movements by medical personnel is also strongly discouraged by the practical soldier. But the personnel of military hospitals and other medical units may be armed for the protection of the wounded, or be guarded by armed troops without relinquishing the privilege attached to their special duties. Hence the sword which forms part of the ornaments of a medical officer's uniform if "Dress Regulations, 1911," are followed with painful and pedantic accuracy need not be discarded in the field for fear of offending a courteous enemy.

REPATRIATION.

While such personnel cannot under the Geneva Convention be treated as prisoners of war, they must, if captured by the enemy, continue to carry out their customary duties, even if such work may include the restoration to health of many temporarily disabled members of the enemy forces in the field. But should

their services become unnecessary at any time, it is then the duty of the Government in whose hands they are to return them to their own country. The time and route are both at the will of the enemy. The earlier Geneva Convention (1864) contained a clause which implied that such personnel must be returned at once if they so desired, or, in any case, immediately on the termination of their duties. Such a rule was obviously improper. Humanity is fallible, and it is unlikely that such information as might be gathered by such personnel would be withheld from their friends when in an ecstasy of joy they rejoined their own army. Consequently the Convention of 1906 left the time and route at the discretion of the captors. France, alone of the Great Powers, was not a party to the later Convention. Thus its effectiveness is, for similar reasons to that eliminating The Hague Conference, greatly reduced during the present war.

On restoration to their native country, medical personnel must be permitted to take with them their personal property. The medical stores in their possession may, if necessary, be requisitioned by the enemy. The arms of the personnel must not be detained. Such requisitioned material, which may include transport, must be used exclusively for the sick.

THE RIGHTS OF WOUNDED.

All officers and men who, on being wounded, are captured must be succoured in proper manner, whatever their nationality may be. While they lie ill, all the resources of medical science available at the moment are their due. No distinction can of right be made between one's own wounded and that of the enemy. If the fortunes of war decide that enemy wounded shall be left in abandoned territory, arrangements should be made for their medical treatment.

A DIFFICULT RULE.

One rule of the 1906 Convention is difficult of execution in and after a battle of parallel warfare—that which places upon the victor the duty of collecting the wounded from the field of battle and of preserving the dead from molestation of their sacred peace. "No Man's Land" is no place even for the gentle duties of the medical personnel.

In open warfare the duty is clear, and is manifestly possible of execution. It is laid down in international agreement, no less than in common wisdom, that the dead shall be buried as soon as may be, and with such respect as is possible. Personal trinkets, private letters and papers, any of those small tokens which, of little value in themselves, are of such high solace to the kindred of the dead should be collected and returned through the allotted channels to the army of which the owners formed part. It is these matters which go far to reduce the full horrors of war.

Each belligerent should supply to the other at proper intervals a list of wounded prisoners in their hands, and a further list, as accurate as conditions will admit, of the enemy dead within their lines. If rumour and

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the public prints are worthy even of partial reliance, it would not appear that this rule has been consistently honoured throughout the present war.

COMMUNICATIONS BETWEEN BELLIGERENTS.

Though war is a continuous series of acts of offence designed to impress the will of one nation upon another, it is necessary in many stages of hostilities for communications to pass between enemies. The less immediate questions dealing with matters of high national import are transmitted diplomatically through the Governments of neutral Powers who, while not engaged in the war, are properly supposed to assist in measures of amelioration in so far as is possible. Thus in England the American Ambassador, until recent events extended the area of the war, maintained a careful watch over the interests of Germans resident in this country. Similarly in Berlin the British population was aided by the United States Embassy.

PEACE PROPOSALS.

Proposals of peace would be submitted through neutral nations in the ordinary course of events, and such Powers would assist in so far as possible in the ultimate settlement. What may be the course adopted in the present war it is hard to surmise, as the abolition of neutrals is rapidly degenerating into a world-wide habit.

But apart from questions of high politics, in which time can be measured in days and weeks rather than in minutes and in hours, there are occasions on which it is necessary for armies in the field and in opposition to each other to communicate on matters of immediate moment. No doubt in these modern days use is made of wireless telegraphy, but as no secret code is possible between enemies if its essential secrecy is to be maintained, there is nothing to indicate either the accuracy or sincerity of the messages so transmitted. It is therefore only possible to make use of the time-honoured flag of truce.

In earlier days the heralds, whose duties now consist in the maintenance and registration of dignities and honours and in the ordering of ceremonies, carried the messages of their royal masters into the enemy lines, and were there received with due courtesy. Their persons were inviolate, and their rank and office respected. To-day the blazonry of heraldry has passed from the field of war, but the same method of communication is still open, if it is possible to convince the enemy that communication is desired. Under the accepted traditions of international law it is not necessary for a commander to respect the white flag unless he has good reason to believe it is flown with the authority of a responsible officer, and that no treachery is intended. It is therefore somewhat difficult to indicate to the enemy the desirability for intercommunication.

THE PARLEMENTAIRE.

Once the flag of truce has been accepted, and the parlementaire, with his trumpeter or drummer, flag-bearer and interpreter, have opened speech with the enemy, or have entered his lines, the sanctity of the white flag must be respected. The parlementaire and his party, unless they are guilty of acts of treachery, must be protected from violence or accident. They may be blindfolded in order to prevent their gaining information as to enemy disposition, and all such precautions as are necessary for the preservation of secrecy may be taken.

On the other hand, no commander need accept a flag of truce. If he does not desire speech with the enemy, there is no obligation on him to permit the approach of the parlementaire.

The most usual reason for communication by flag of truce is the arrangement of an armistice between the two forces for some such purpose as the burial of dead. On several occasions during the operations in the Dardanelles a temporary cessation of hostilities was

arranged on sectors of the various fronts that "No Man's Land" might be cleared of its superabundant corpses. At no time was the arrangement abused.

The terms of the armistice are carefully arranged. The duration is generally stated clearly. When this course is not adopted, a system of warning is scheduled to indicate the lapse of time between a given signal and the resumption of hostilities. This arrangement does not remove the right of either belligerent to reopen hostilities immediately if the enemy commit any act which is clear violation of the terms of the armistice. During such a temporary peace, neither belligerent is permitted to carry out works of military value in the regions affected by the truce, nor should the opportunity be taken to gain information as to enemy dispositions. But should any individual on either side offend against the terms of truce, no general action can be taken unless it can be proved that his act has the sanction of his supreme commander. Normally his punishment can be requested.

It is occasionally desirable to protect certain people or houses or villages from outrage, which under conditions prevailing is of likely occurrence. Circumstances may prevent the removal of such threatened persons, and in any case buildings cannot be replaced in safer areas. Consequently, if both belligerents are agreed, a small force of troops, known as a "Safeguard," may be stationed at the points desiring protection. These troops, should the enemy occupy the territory in which they are posted, are inviolate and secure from detention as prisoners of war. They must be returned to the outposts of their own army at the first convenient opportunity, under the same conditions as apply to medical personnel.

A "cartel," a name of historic association, is usually a written agreement between belligerents to permit certain degrees of intercourse between inhabitants in territories in hostile occupation. In ideal wars conducted with old-world chivalry certain trade intercourse is permitted in commodities which do not affect the due course of hostilities.

The old meaning of a "cartel," surviving under modern conditions, is as an agreement relative to the interchange of prisoners of war.

IN CONCLUSION.

This series of articles has now drawn to a close. Few of the matters under treatment have directly concerned aviation, the subject for which this paper exists, but all have indirect relation of high importance to the military use of aircraft. Military science is not yet popular at the firesides of the nation, and, if Fortune is kind, the Daily Press will ever preserve its entire ignorance of the principles of warfare. Popularity is no criterion of usefulness in life. The difficulty of mastering the intricacies of what is a lifelong profession to its followers should attract those whose minds are active and who desire to attain distinction in His Majesty's Service. These pieces cannot provide the key, but if any line in any one may attract a young officer to the further study of the most fascinating science in the world, the writer's purpose will be well served.

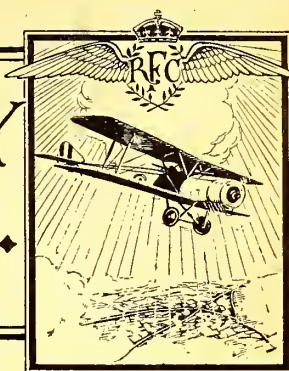
(The End.)

ANTI-AIRCRAFT FREEMASONRY.

In the presence of nearly 500 members of the craft the Grand Secretary, Sir Edward Letchworth, on April 14th, consecrated the Royal Naval Anti-aircraft Lodge, No. 3,790. The membership will be limited to members of the Anti-aircraft Service. The Bible used in the ceremony and the warrant of the lodge were bound with boards cut from a piece of the propeller of one of the Zeppelins brought down in England, and part of the regalia of the lodge officers was made of aluminium from the Zeppelins brought down at Cuffley and in Essex. Sir Edward Letchworth was assisted by Admiral Sir Hastings Markham, Rear-Admiral E. F. Inglefield (Provincial Grand Master, Buckingham), Inspector General Belgrave Ninnis, the Bishop of Willesden, and Mr. G. Woods Wollaston, M.V.O.



NAVAL *and* MILITARY AERONAUTICS



FROM THE "LONDON GAZETTE."

WAR OFFICE, April 10th.

REGULAR FORCES.—STAFF.—ATTACHED TO HDQR. UNITS.—
Dep. Dir.-Gen.—Bt. Col. (temp. Brig.-Gen.) W. S. Brancker,
R.A., from a Dir., and to retain his temp. rank whilst so
empld., Feb. 28th.

Dir.—Bt. Lt.-Col. L. E. O. Charlton, C.M.G., D.S.O., Lan.
Fus., from a G.S.O., 1st Grade, and to be temp. Brig.-Gen.
whilst so empld., vice Bt. Col. (temp. Brig.-Gen.) Brancker,
R.A., Feb. 28th.

Dep. Asst. Dir.—Maj. and Bt. Lt.-Col. W. D. Dooner, A.
Ord. Dept., from Ord. Officer, 2nd Cl., and to be temp. Lt.-Col.,
March 19th.

D.A.A.G.—Lt. (temp. Maj.) H. S. Ebben, R.F.C., Spec. Res.,
from graded as a Park Comdr., and to retain his temp. rank
whilst so empld., Feb. 28th.

Staff Capt.—Capt. C. F. Gordon, M.C., N. Staff R., vice
Maj. D. H. Cameron, ret. pay, Ind. Army, Feb. 28th, 1917.

R.F.C.—MIL. WING.—Flt. Comdrs.—From Flying Officers,
and to be temp. Cpts. whilst so empld.—Temp. Sec. Lt. A.
Binnie, Gen. List, March 21st. Temp. Sec. Lt. R. D. Baker,
Gen. List, March 27th.

ROYAL REGIMENT OF ARTILLERY.—To be actg. Majs. whilst
comdg. Anti-Aircraft Batts.—Capt. H. A. S. Wurtele, temp.
Capt. H. J. Muir, Sec. Lt. (temp. Capt.) N. J. A. Foster, M.C.,
T.F., Lt. (actg. Capt.) E. C. Harrison, T.F., Feb. 4th.

* * *

WAR OFFICE, April 11th.

REGULAR FORCES.—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Sqdn. Comdr.—Sec. Lt. (temp. Capt.) H. V. Champion de
Crespigny, M.C., Suff. R., from a Flt. Comdr., and to be temp.
Maj. whilst so empld., March 21st.

Flt. Comdrs.—From Flying Officers, and to be temp. Cpts.
whilst so empld.:—Lt. G. Alchin, R.F.A., S.R.; Lt. R. A.
Delhaye, S.R., March 24th. Sec. Lt. (temp. Lt.) L. H. Peter,
R.E., T.F., March 25th.

* * *

WAR OFFICE, April 12th.

REGULAR FORCES.—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Spec. Appt.—(Graded as a Park Comdr.)—Sec. Lt. (temp.
Lt.) H. G. Gold, Spec. Res., from a Special Appt. (graded as an
Equipment Officer, 2nd Cl.), and to be temp. Maj. whilst so em-
ployed, vice Lt. (temp. Maj.) H. S. Ebben, Spec. Res., Feb. 28th.

* * *

WAR OFFICE, April 13th.

REGULAR FORCES.—ESTABLISHMENTS.—R.F.C.—MIL.
WING.—Equipment Officers, 1st Cl.—Lt. J. H. Banks, Gen.
List, from the 2nd Cl., and to be temp. Capt. whilst so empld.,
March 1st.

MEMORANDUM.—Sgt. H. V. Jerrard, from R.F.C., to be Sec.
Lt., for duty with R.F.C. (June 4th, 1916) (substd. for notifica-
tion in "Gazettes" of July 3rd and Aug. 3rd, 1916).

* * *

The King has been graciously pleased to become Colonel-in-
Chief of the Royal Flying Corps (Naval and Military Wings) to
mark his admiration of the splendid services which both Wings
have rendered since the commencement of the war.

* * *

WAR OFFICE, April 14th.

REGULAR FORCES.—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Flt. Comdrs.—Capt. J. W. Thomson-Glover, Ind. Army, from
a Flying Officer, March 19th. From a Flying Officer, and to
be temp. Capt. whilst so employed:—Temp. Sec. Lt. C. C. Brill,
Gen. List, March 31st.

* * *

WAR OFFICE, April 16th.

The following N.C.O. to be Sec. Lt. for service in the Field:—
REGULAR FORCES.—INFANTRY.—SOM. L.I.—Sgt. E. Porter,
from R.F.C., and to be secd. for duty with the R.F.C.,
March 11th.

The undermentioned N.C.Os. to be temp. Sec. Lts.:—

MEMORANDUM.—For duty with R.F.C.—Sgt. W. T. Walder,
March 10th. Sgt. E. C. E. Derwin, March 16th.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Flt. Comdr.—Sec. Lt.
(temp. Capt.) H. L. H. Owen, Dorset R., T.F., from a Flying
Officer, and to retain his temp. rank while so empld., Mar. 31st.

SCHOOLS OF INSTRUCTION.—CENTRAL FLYING SCHOOL.—Asst.
Comdt.—Capt. (temp Lt.-Col.) L. A. Strange, M.C., Dorset R.,
from a Comdt., R.F.C. School of Aerial Gunnery (graded as a
Wing Comdr.), to retain the grading of Wing Comdr. and his
temp. rank whilst so empld., April 1st.

MEMORANDUM.—His Majesty the King to be Colonel-in-Chief of
the Royal Flying Corps (Naval and Military Wings).

FROM THE COURT CIRCULAR.

WINDSOR CASTLE, April 14th.

The following Officers had the honour of being received
by the King, when His Majesty invested them with the Insignia
of Companions of the Orders into which they have been ad-
mitted:—

THE DISTINGUISHED SERVICE ORDER.

Lt. George Mutch, Gordon Highrs., attd. R.F.C.

The King then conferred decorations as follows:—

THE MILITARY CROSS.

Major Reginald Maxwell, R.F.C.

Capt. James Chalmers, R.F.C.

Capt. Robert Hudson, R.F.C.

Capt. Allen Higson-Smith, R.F.C.

NAVAL.

ADMIRALTY COMMUNIQUE

APRIL 16th.—In consequence of the attacks made by German
submarines on British hospital ships in direct and flagrant con-
travention of Hague Convention No. 10, a large squadron,
composed of British and French aeroplanes, carried out a
reprisal bombardment of the town of Freiburg, on Saturday,
April 14th.

Many bombs were dropped with good results. In spite of
a large number of air fights with hostile aeroplanes, all machines
returned safely, with the exception of three.

The story of the naval operations in connection with the with-
drawal of the Army from the Gallipoli Peninsula is told in dis-
patches published on April 11th from Vice-Admiral Sir John
M. de Robeck, late Vice-Admiral Commanding the Eastern
Mediterranean Squadron, and Vice-Admiral Sir Rosslyn E.
Wemyss, late Senior Naval Officer, Mudros.

The first dispatch from Sir Rosslyn Wemyss, dated Dec.
22nd, 1915, describes how the evacuation of the positions at
Suvla and Anzac in Dec., 1915, was carried out. He says:—

The final concentration of the ships and craft required at
Kephala was completed on Dec. 17th, and in order to prevent
enemy's aircraft observing the unusual quantity of shipping,
a constant air patrol was maintained to keep these at a dis-
tance.

Admiral de Robeck's dispatch, dated Jan. 26th, 1916, deals
with the withdrawal of the Army from the Gallipoli Peninsula.
He writes:—

The preliminary stage commenced on the night of Dec.
30th-31st and terminated on the night of Jan. 7th-8th.

During the whole time there remained the paramount neces-
sity of preventing the enemy gaining intelligence of what
was in progress; this added greatly to the difficulties of work
during daylight. Enemy aircraft paid frequent visits to the
peninsula; on these occasions, whilst the "Taube" was in
evidence, animals and transports approaching the beaches were
turned and marched in the opposite direction, and stores and
horses already in lighters were even unloaded onto the beaches
to give the appearance of a disembarkation.

Despite the statement that a constant air patrol was main-
tained, one notices that all reference to the good work of the
R.N.A.S. is omitted, and that neither the Air Service as such,
nor any officer therein is mentioned in dispatches. One hopes,
therefore, that this is an intentional omission on account of the
future issue of a separate dispatch dealing exclusively with
R.N.A.S. operations in Gallipoli.

The following appointment has been made in the Royal Naval Air Service:—

APRIL 11th.—Flt. Comdr.—S. V. Sippe, D.S.O., granted temp. act. rank of Sqdrn. Comdr., seny. April 7th.

THE CASUALTY LIST.

DIED OF WOUNDS.—Carney, R. H., Air Mech., 1st Grade.
MISSING.—Jones, W. E., Ldg. Mech., 217874.

Reported April 16th.

KILLED.—Thorne, Flt. Sub-Lt. Alfred L., R.N.
SERIOUSLY INJURED.—Morell, Prob. Flt. Sub-Lt. James A., R.N.
MISSING.—Weil, Flt. Sub-Lt. Louis M. B., R.N.
Hewitt, Flt. Sub-Lt. Neville D. M., R.N.

[See German Communiqué, April 15th.—Ed.]

PREVIOUSLY BELIEVED PRISONER, NOW REPORTED WOUNDED AND PRISONER IN BULGARIA.—Beare, Flt. Sub-Lt. Sidney G., R.N.

Reported April 17th.

KILLED.—Petre, Actg. Sqdn. Comdr. John J., D.S.C., R.N.
Hill, Lt. Samuel G., R.N.V.R.

MISSING.—Mack, Actg. Flt. Comdr. Robin G., R.N.

PERSONAL NOTICES.

DEATHS.

KNIGHT.—Flt. Sub-Lt. R. V. Knight, R.N., had been flying six months, and was an assistant instructor when he fell on March 12th. He was aged 23. He was born at Milton Hill, Wells, and was educated at Wells and Bedford Grammar Schools.

He volunteered from Guy's Hospital on the declaration of war, was appointed Lt. in the 8th London Post-Office Rifles, and fought with them at the battles of Festubert and Loos.

He was a model of an athlete, standing 6 ft. 2 in., and he was broad in proportion. At football, he was Capt. of Bedford, held East Midland and Somerset Caps, and was reserve for England at 19. He often wintered in Switzerland, and learnt skiing and skating, being especially good at ice hockey. Besides being an adept in swimming and diving, he was a good cricketer, and captained the Somerset Stragglers for three years. All who knew him regret the loss of a fine sportsman and a good friend.

* * *

PETRE.—It is with great regret that one records the death in action of Flight Commander (Acting Squadron Commander) John J. Petre, D.S.C., whose death appears in the Casualty List published on April 17th.

This officer belonged to the ancient Roman Catholic family of Petre, his particular branch of which has been domiciled at Ingatestone in Essex for many generations. He was a brother of the two famous brothers, Henry and Edward Petre, who were among the pioneers of British aviation. Edward Petre was killed at Marske, near Redcar, on Christmas Eve of 1912, in the course of the longest cross-country flight on record, having started that morning from Brooklands. Henry Petre, now a major, R.F.C., went to Australia in 1912, and founded the Australian Flying Corps, which has done such excellent work in the war.

John Petre, who was educated at Stoneyhurst, joined the R.N.A.S. early in the war, and was one of the first batch of pilots trained by Mr. Bernard Fowler (now Flight Commander, R.N.) at Eastbourne. This group, which consisted of Maurice Wright, F. S. Dawson, Vincent Nichol, J. Huskisson, and John Petre, all turned out extremely good flyers, and several of them have distinguished themselves by winning honours and promotion. John Petre, a quiet and reserved lad at first, displayed exceptional ability as an officer, besides being a fine pilot, and won rapid special promotion, so that, despite his youth, he has been for some considerable time an Acting Squadron Commander.

He was held in high personal regard by his senior officers, as well as by those who served with and under him, and he is a very great loss to the service.

To his parents, who have already lost one dearly loved son in the cause of aviation, one ventures to extend the deep sympathy of all those who have seen the work which their sons have done for the development of flying and for their country's welfare. Like all the old county families, the Petres have done their duty admirably.

MILITARY.

G.H.Q. COMMUNIQUÉS.

APRIL 10th, 9.27 p.m.—Our aeroplanes performed valuable work yesterday in co-operation with our infantry, and in a number of cases inflicted casualties with machine-gun fire on hostile reinforcements.

Bombing expeditions were also carried out in which a number of hits were obtained upon a large railway station utilised by the enemy, and three trains were wrecked.

As a result of air fighting, three German aeroplanes were destroyed and four others were forced down. One of our machines is missing.

APRIL 11th, 9.19 p.m.—Our aeroplanes were active again yesterday, and, in spite of a strong westerly gale and frequent snowstorms, performed valuable work in co-operation with our infantry. Few hostile machines were seen, and all our aeroplanes returned safely.

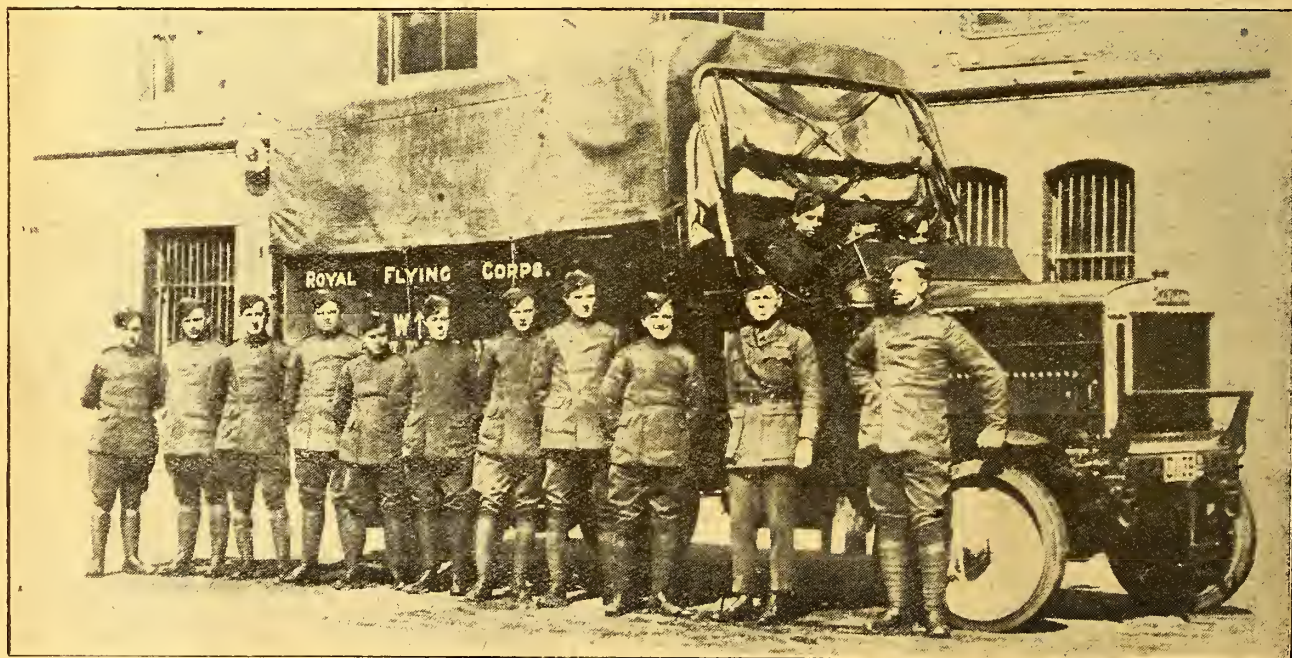
APRIL 12th, 9.53 p.m.—In spite of exceedingly bad weather for aerial work our aeroplanes were active again yesterday, and seized every opportunity to harass hostile troops with machine-gun fire.

During a short fine period one of our Naval squadrons, while escorting British bombing machines, was heavily attacked by a number of hostile aeroplanes, and did exceptionally well. Without suffering any loss itself it destroyed three of the attacking machines failed to return, and three others were brought down.

Altogether four German aeroplanes were brought down yesterday, and five others were driven down damaged. Six of our machines failed to return, and three others were brought down.

APRIL 13th, 9.25 p.m.—Much useful work was done by our aeroplanes yesterday, although the weather continued to be unfavourable for flying. The only hostile formation encountered

(Continued on page 999.)



An R.F.C. Recruiting Party in Toronto, Canada.

Photographs by "Sport and General."

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INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

The British Aircraft Industry.

BY CHARLES L. FREESTON.

(Founder Member of the Royal Aero Club.)

XII.—THE GREEN ENGINE CO., LTD.

If the development of the British aeroplane was slow, for perfectly intelligible reasons, that of the British aircraft motor was, unfortunately, even more tardy. Not every follower of aviation will remember, and the majority of present-day pilots never knew, how insistent was the cry in the early days for an all-British machine. The home-built aeroplane itself came along, but if it was to have any chance in open competitions it had to be fitted with an engine of continental origin, and at one time this state of things seemed likely to be chronic.

Of course, there were a few—very few—attempts on the part of British designers at building an aircraft motor in this country, and credit must be given even to those who failed, for at least they sacrificed their time and money, at a period when faith in aviation was at a very low ebb, and even an engine successful in itself appeared to have but a poor commercial future. The non-scientific and unpaternal attitude of the Government of those days was terrible to contemplate, and the situation held out little hope either to the struggling inventor or to the firm which, prospering in its own line, was naturally chary of devoting shareholders' capital to experimental research. The one striking instance of a limited company specifically endeavouring to foster the new movement was that of the Humber Co., of Coventry, but this praiseworthy effort merely saddled them with a loss of several thousand pounds.

A PERSEVERING BRITON.

Through all this troublous era, however, there was one persevering Briton who never veered from his resolve to produce an aircraft motor which should worthily uphold the honour of the old country and save it from its entire dependence upon foreign engines. The man in question was Mr. Gustavus Green, an engineer of Bexhill-on-Sea.

How long and arduous was the road to success may be gathered from the fact that his first 35 h.p. engine was produced so far back as 1905. Motoring experts will remember the keen interest it aroused at the Olympia Show when first ex-

hibited in experimental form, in a dark corner beneath the gallery, and with what pleasure it was noted a year later that improvements had been effected, and that it bade fair to realise the inventor's ideals. His prime object was to save weight, but at the same time to combine great strength and reliability with the quality of lightness.

THE FIRST AERO-ENGINE.

Not until 1908, however, was the Green engine in any sense a commercial proposition. It was applied to aeroplane use in that year, and was also employed in the "Beta" airship. Then in 1909 it scored its first public success, for it was fitted to the

Short biplane in which Mr. (now Major) J. T. C. Moore-Brabazon gained the "Daily Mail" £1,000 prize at Eastchurch for the first circular mile flight on an all-British machine.

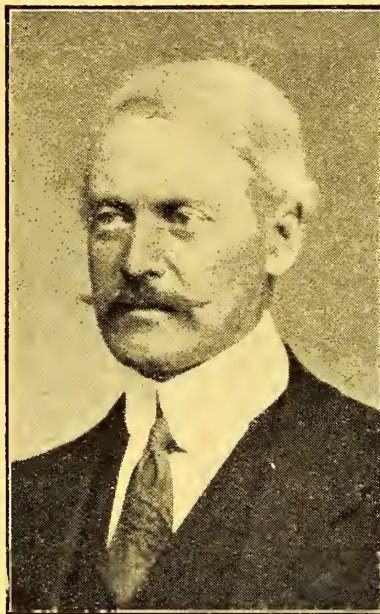
Soon after this it scored another record by winning the Michelin Cup for a cross-country flight, the distance covered being 17 miles. One may smile nowadays at the lowly figure, but it was none the less pregnant with promise.

MR. MAY'S INTEREST.

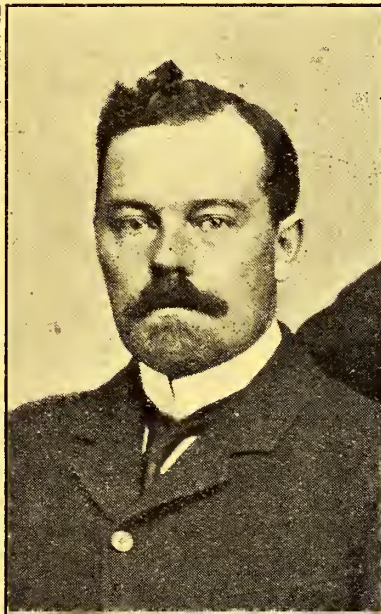
Then a new factor—a human one—entered upon the scene in 1910 in the person of Mr. Fred May, the present managing director of the Green Engine Co. A well-known motor-boating enthusiast, who steered one "Defender" after another to victory, he became impressed with the quali-

ties of the Green engine by the behaviour of one which he had bought and fitted to a motor-boat. He had found trouble with almost every other engine, but not with the Green, and as a result he decided to identify himself with the motor from the commercial point of view. From that date to this Mr. Fred May and the Green engine have been inseparable, and it was owing to his unremitting efforts that the firm weathered the storms of the next four years.

He began to study aviation forthwith, and recalls his first ascent in an Avro machine, fitted with a 35-h.p. Green, and with Mr. Pixton as pilot. The Avro rose to the "enormous" height of 800 ft., and when Mr. May came down he was the recipient of congratulations from anxious spectators whose relief was expressed in fervent handshakes.



MR. GUSTAVUS GREEN.



MR. FRED MAY.

ANOTHER SCORE.

In the same year the Green engine on a Cody biplane laid the long distance Michelin prize to its credit, and was also the only competitor to complete the 24 hours' run in the Patrick Alexander competition at the National Physical Laboratory. The prize of £1,000 was withheld, however, on technical grounds, as the engine, described as a 35 h.p., actually gave 32½ h.p. It gained, nevertheless, the silver medal of the Aerial League of the British Empire, the highest award for efficiency in aerial motor construction for the year.

ANOTHER MICHELIN CUP.

The Michelin cross-country competition was won in 1911 with a performance of 123 miles, and also the Michelin long distance contest with 261 miles 800 yards, both performances being by the redoubtable Mr. S. F. Cody, using a 60-h.p. Green.

In the "Circuit of Great Britain" race, one Green engine was entered, again by Mr. Cody, and went through without being touched in any respect, in a journey of 1,010 miles.

THE SECOND ALEXANDER PRIZE.

The 60-h.p. engine also succeeded in carrying off the Patrick Alexander prize of £1,000. The achievement was the more remarkable from the fact that the competition had now become international, under Government supervision, and the Green thus set up a world's record for any type of internal combustion engine.

Subsequently the Aerial League awarded it the gold medal for the most meritorious performance of the year.

ANOTHER MICHELIN SCORE.

Again in 1912 the Michelin cross-country prize was annexed, with a flight of 186 miles by Mr. Cody, and the Green engine scored second place in the duration contest, Mr. Raynham doing 7 hours 23 min. on the totally-enclosed Avro, but Mr. Hawker afterwards raised this by 40 minutes on a Sopwith-built Wright. The totally-enclosed Avro had previously made a very good show, piloted by Lieut. Parke, R.N., at the military trials.

AN AMPHIBIAN VICTORY.

It was in 1913, however, that the Green engine scored its chief outdoor successes. The first triumph was the winning of the Mortimer Singer £500 prize. In this very searching competition the seaplane had to rise six times from the land, six times from the water, and rise to a height of 1,500 ft.

Anyone who had experience of the reliability trials of the early motoring days will remember that nothing was so productive of failure as an officially interrupted or restricted performance, as compared with a continuous go-as-you-please journey, and the performance of the Green and Sopwith "Bat-Boat" combination, under the conditions above named, was the more noteworthy accordingly.

ROUND BRITAIN.

The "star performance" to the credit of the Green engine, however, was the "Round Britain" seaplane contest. Only Mr. Hawker ventured to start, his mount being a Sopwith tractor with a 100-h.p. Green motor, and he put up the fine record of 1,043 miles. Everything was going well when, off the Skerries, County Dublin, his foot slipped on the rudder-bar and he made a bad "landing." It was hard luck on everybody concerned, as there was no reason whatever for supposing that the total circuit would not have been compassed in successful fashion, but for what was a pure accident unconnected with the efficiency of either the engine or the machine. As a matter of interest it may be mentioned that the engine used on this occasion is still running and doing good and regular work.

THE SEVENTH MICHELIN WIN.

With a flight of 300 miles, carrying a passenger, the Green engine won its seventh Michelin prize in the following year, on a Grahame-White machine. In the way of interrupted runs, this was much more remarkable as a test than the Mortimer Singer event. The mileage was amassed by means of repeated journeys between Hendon and Brooklands, a distance of 19 miles as the crow flies, and a landing had to be made, and the engine stopped, every time one aerodrome or the other was reached.

THE GREAT ENGINE COMPETITION.

By this time, of course, the Green had attained a pre-eminent position among strictly British motors. If anything better could be produced, the offering of a £5,000 prize by the Government was bound to bring it forth, and in 1914 was held the great Naval and Military Aeroplane Engine Competition, which was one of the very few examples of official stimulus which the history of aviation in this country can disclose.

The prize was certainly worth winning, and as the conditions of the contest were announced in June, 1913, and the actual competition did not take place until April 30th, 1914, it was hoped that a new array of inventions would be forthcoming in appreciable numbers. As a matter of fact, the list of entrants included 27 firms in all, of whom 13 were unknown to fame, but the regrettable fact has to be chronicled that 12 of these failed to put in an appearance. As several of the competing firms put in more than one type, there were 56 engines entered in all, but 29 of these were withdrawn before

the start, five after the start, and eight after failing to complete the eliminating test.

The chief requirements to be fulfilled by the competing engines were as follows:

1. Horse-power: 90 to 200.
2. Number of cylinders: to be more than four.
3. Gross weight per horse-power: calculated for six hours' run, not to exceed 11 lb.
4. Shape of engine: to be suitable for fitting in an aeroplane.
5. Origin of engine: British manufacture throughout (except magneto).

A number of items were laid down in advance, however, as being considered desirable attributes of an aeroplane engine. They were defined as hereunder:—

1. Light total weight.
2. Economy of consumption.
3. Absence of vibration
4. Smooth running, whether in normal or inclined position, and whether at full power or throttled down.
5. Slow running under light load.
6. Workmanship.
7. Silence.
8. Absence of deterioration after tests.
9. Simplicity of construction.
10. Suitable shape to minimise head resistance.
11. Precautions against accidental stoppage, e.g., dual ignition.
12. Adaptable for starting otherwise than by propeller swing-ing.
13. Accessibility of parts.
14. Freedom from risk of fire.
15. Absence of smoke or of ejections of oil or petrol.
16. Convenience of fitting in aeroplane.
17. Relative invulnerability to small-arm projectiles.
18. Economy (in bulk, weight and number) of minimum spare part equipment.
19. Excellence of material.
20. Reasonable price.
21. Satisfactory running under climatic variations of temperature.

This was a fairly comprehensive list, but it would be interesting to see how it would compare with a tabulation of desiderata if a competition were held now after nigh three years of warfare.

As for the tests themselves, which were carried out at the Royal Aircraft Factory, they consisted of (1) Two runs of six hours each, at full power or throttled down, as desired by the judges. The engines were to be placed in inclined positions not exceeding 15 deg. for short special runs. (2) The consumption of fuel and lubricant was measured. (3) The engines were to be dismantled during the runs if desired by either the competitors or the judges, but no work of any kind was to be done except under observation. (4) At any period during the competition the judges might impose (and as a matter of fact did) such other tests as they might desire, including runs of longer duration, in order to bring out the relative merits of competing engines.

A RECORD RUN.

The Green Engine Co. put in two engines, of 100-h.p. each, the object being to take no risks with one, and with the other to show what it could do. The second engine ran for 62 hours 10 min., when it was stopped on the firm's own accord, as it had beaten every other competitor.

The trials were continued for over three months—until after the declaration of war, in fact—and the Green engine No. 2, which had made so lengthy a run, was hurried off straightaway for actual service.

Eventually the Judges Committee issued their report, and stated that in their opinion "the Green 100-h.p. water-cooled engine fulfilled the requirements specified as to power, weight, shape, and manufacture, and possessed the greatest percentage of those attributes which are desirable in an aeroplane engine," and the prize of £5,000 was therefore awarded to the Green Engine Co.

Thirteen engines, including the two Greens, also earned £100 each in respect of completing the six hours' eliminating trial and thus establishing themselves as "useful aeroplane engines."

SUCCESS.

After this outstanding achievement, of course, there was no looking back for the Green-Engine Co. They have been engaged on Admiralty and War Office work continuously during the war, and have brought out further models of 160-h.p. and 275-h.p. respectively. Their engines have also been supplied to the Russian and American Governments.

The Green motor, it should be added, has not only been fitted in large numbers to aeroplanes, but has also displayed its trustworthy qualities on airships.

Finally, it may be remarked that though this résumé is naturally devoid of the more romantic elements which attach to the careers of aeroplane constructors, it constitutes a record of sustained effort and achievement of which the firm has every reason to be proud, and the more so from the fact that it attained fruition before the war itself was begun.

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A paper was read by Mr. A. P. Young, A.M.I.E.E., A.I.A.E., on April 4th, on "The High-Tension Magneto, with special reference to the Ignition of Aeroplane Engines."

The following extracts deal specifically with British magnetos, and indicate to some degree the excellent work which is being done by British manufacturers:—

PART II.—AEROPLANE TYPE MAGNETOS.

GENERAL.

The greater number of the magnetos built in this country since the outbreak of war have been used on aeroplanes. This means that the British magneto industry, from the moment of its inception, had to contend with the most difficult problem of all, because it is generally recognised that an aeroplane magneto has to operate under more severe and exacting conditions than obtain on any form of motor vehicle.

The mantle of responsibility was borne during the early stages of the war by the firm of Thomson Bennett, in Birmingham (who, to their credit, were struggling to create a magneto industry before the war); the B.T.H. Co., in Coventry; and the M.L. Magneto Syndicate, in Coventry. More recently many newcomers have joined the industry, with the result that at the present moment there are no less than 15 manufacturers engaged on this most important work.

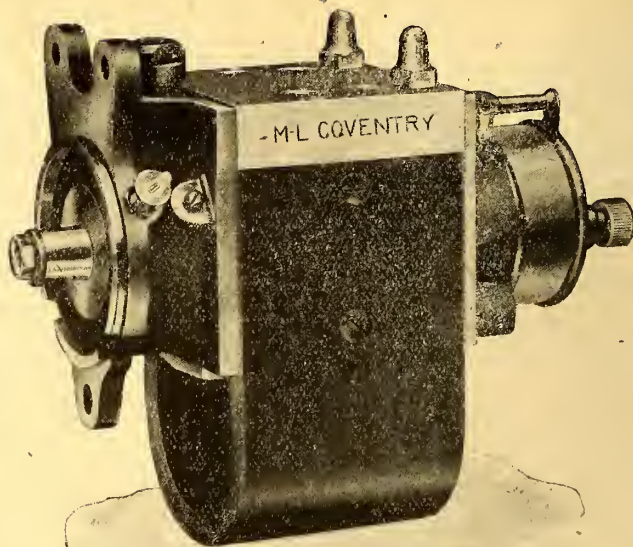
Special credit is due to the three manufacturers named above, and in particular I should like to refer to the most excellent work that has been done by Mr. E. A. Watson, who is technical director of the firm of the M.L. Magneto Syndicate, on the technical side of the business. Mr. J. D. Morgan, who is associated with the firm of Thomson Bennett, has also done a large amount of research work, more particularly in connection with the process of ignition by electric spark.

As evidence of what has already been done, I propose to describe some of the aeroplane type magnetos that are now being produced in very large quantities by the three manufacturers specially mentioned. I am naturally in a position to deal more fully, and at greater length, with the products of the B.T.H. Co., but I wish to make it clear that my object in doing this is chiefly to develop a method of analysing the characteristics of a H.T. magneto, which is quite general in its application, and at the same time to indicate certain methods of testing which applied to different magnetos enable these characteristics to be compared.

M.L. Magneto Syndicate Type A.D.S. Magneto.

This magneto, which is of the rotating armature single-cylinder type intended for use on rotary engines of the Gnome, Monosoupape, Clerget, or similar types, is based on the original Bosch D.A.L. design, but has been improved in many respects. Its weight has been reduced by carefully designing the castings without in any way reducing its strength. The fixing of the terminal has been improved, the old socket fitting half in gunmetal and half in aluminium being done away with, and the terminal now screwing directly into the gunmetal end. In addition, the cable connection has been made waterproof and more secure, so as to diminish any risk of the cable becoming detached while running.

The chief modifications, however, which have been found necessary have been in connection with the contact breaker and the cams, as these machines have to run at a very high speed, from 2,500 to 3,500 r.p.m. Consequently the old Bosch design



The M.L. Magneto Syndicate's British Magneto.

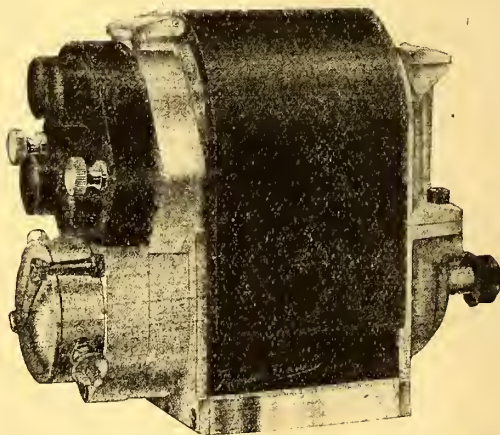
of flat cam which gave rapid acceleration of the contact breaker arm has been given up, and the cams now fitted are made to a correctly-shaped profile which is ground out on machines specially designed and constructed for the purpose.

In addition, it has been found necessary to increase the length of opening the primary circuit—that is, to reduce the ratio $\frac{\theta_1}{\theta_2}$

= k —in order to give time for the spark to die out when the machine is working at a high speed. This alteration has completely removed a trouble experienced with the D.A.L. type of misfiring if the engine were inclined to be oily, and has removed the necessity, previously apparent, for very close and careful setting of the plug points. It has also increased the life of the contact breaker arm and the platinum points, and has made the machine suitable for use at much higher speeds. The cam, it should be mentioned, is made from a continuous ring of steel, very carefully ground inside and out in order to ensure absolute concentricity.

Thomson-Bennett Type A.D.4 Magneto.

This is a four-cylinder machine of the rotating armature type, corresponding in size to the Bosch type Z.U.4 magneto used extensively in this country during the years preceding the outbreak of war.



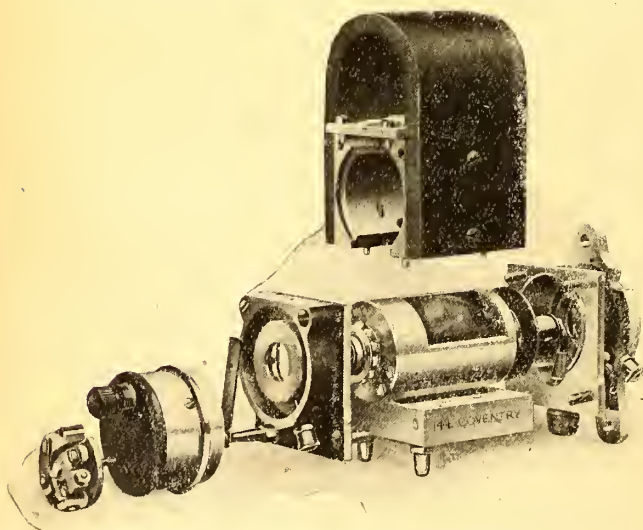
The Thompson-Bennett Type A.D.4. Magneto.

The Bosch design has been simplified, chiefly in respect of the construction of the bearing for half-speed wheel, but many of the other features have been retained. Very large numbers of these magnetos have been supplied for aeroplanes, and the extended experience gained with them has been entirely satisfactory in every respect.

B.T.H. Eight-Cylinder Type A.8.S. Sleeve Inductor Magneto.

GENERAL DESCRIPTION

This magneto is of the sleeve inductor type with fixed armature. It is designed to give four sparks per revolution, and is therefore fundamentally different from the ordinary rotating armature type of magneto, which cannot give more than two sparks per revolution. The sleeve inductor rotates, of course, at engine



The M.L. Magneto Syndicate's British Magneto, disassembled.

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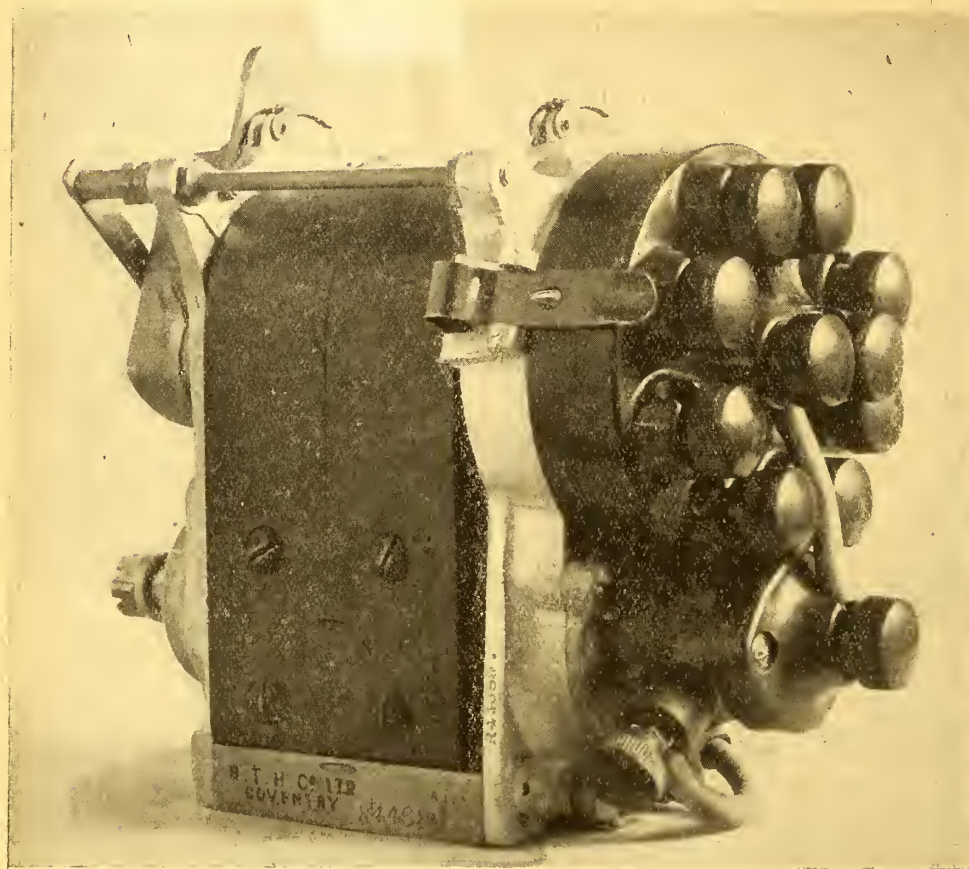
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The British Thompson-Houston 8-Cylinder Magneto

speed. A six-cylinder machine (Type A.6.S.) is also built on the same principle, designed to run at three-quarter engine speed, but as this differs from the eight-cylinder machine only in respect of the distributor and gearing, I shall confine my attention to the type A.8.S. machine.

In the contact-breaker, a pivoted steel bell crank lever arm carries at one end a fibre block which is actuated by the rotating eight-part hardened steel cam rigidly fixed to the distributor brush spindle, while at its other end the movable platinum contact screw is secured. A very strong steel spring fixed at one end to the contact lever arm and at the other end to the base plate serves to force the movable contact tightly against the adjustable fixed contact when the cam is not in engagement with the fibre heel.

It is clear, therefore, that the contacts are opened eight times during each revolution of the cam shaft, which rotates at half the speed of the sleeve inductor, thus giving four breaks per revolution of the latter—as desired.

It is evident that the manufacture of such a magneto on a large scale must have been attended with considerable difficulties, because there are no less than 397 parts of different design, and a total of 860 parts are actually used in the construction of one machine. Bearing all this in mind, it is very gratifying to know that magnetos of this type are being produced in very large quantities, and the known excellence of these machines speaks volumes for the organisation responsible for their production, which

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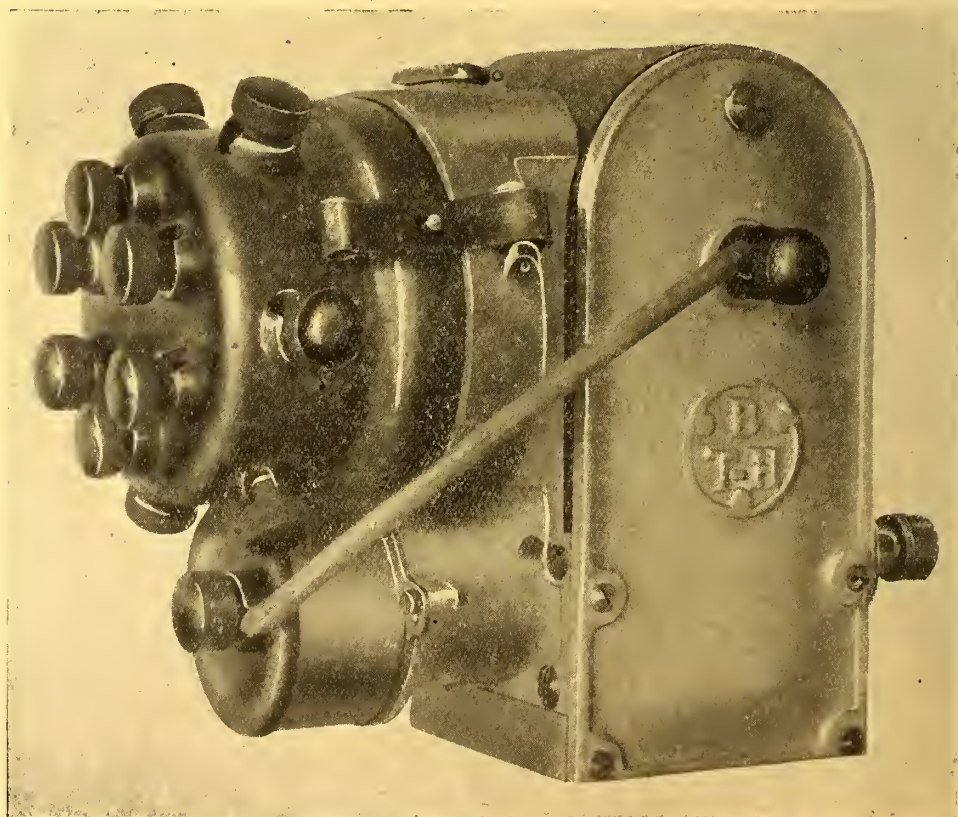
the secondary at "break," I referred to the advantages likely to result from the use of a distributor brush that is designed to allow a very slight clearance between the face of the brush and the distributor segment. Such an arrangement is used in the type "A" magneto, and it has proved thoroughly reliable and satisfactory.

The brush is made of steel and has V grooves in its active face, with a central slot for taking the square head of the locking screw. The brush is of rectangular section, and it is free to move in a brass tube, moulded into the insulation. A spring forces the brush outwards against the head of the locking screw.

Obviously, the screw is automatically locked, and the air gap between the face of the brush and the track of the distributor can be readily adjusted by first depressing the brush until the head of the screw is clear and then turning the latter either one way or the other.

A quarter of a turn on the screw, which gives the minimum adjustment, alters the air gap by 0.002 in. When properly adjusted, the air gap should be between 0.01 in. and 0.014 in.

The amount of wear on the face of the brush after continuous use is so small as to be almost negligible. We have run a brush of this kind on a magneto at 2,500 r.p.m. for 300 hours, and at the end of that time the face of the brush was,



The British Thompson-Houston 12-Cylinder Magneto.



ARMSTRONG, WHITWORTH

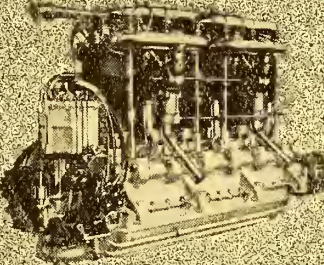
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for all practical purposes, as good as that of a new brush. There was no sign of any pitting.

MECHANICAL CONSIDERATIONS.

It does not seem to be generally appreciated that the manufacture of magnetos can only be undertaken successfully if very skilled labour is available, and the necessary steps are taken to machine all the component parts to extremely fine limits. The type "A" magneto is so complicated in design that the difficulties encountered in manufacturing it on a commercial basis are, without doubt, much greater than in the case of any other type of magneto being produced in England at the present time.

Take, for example, the rotating sleeve inductor. It comprises two soft iron segments which are secured by means of screws and dowel pins to a non-magnetic nickel steel end plate and spindle on the one hand, and to a gunmetal end plate carrying the distributor gear-wheel driving pinion on the other. A glance at the illustration will suffice to make clear the general construction. It should be particularly noted also that the rotating sleeve inductor has to run on three ball-bearings, all of which must be in perfect alignment. The outer race of one bearing is carried by the aluminium driving end plate, whilst the inner races of the other two are securely fixed to the respective ends of the stationary armature end plates.

The clearance on each side of the sleeve inductor is only 0.006 in., and it is clear, therefore, that extraordinary precautions must be taken in manufacture to ensure that after assembly the sleeve will be perfectly free, and neither too tight nor too loose in its bearings.

In the manufacture of the type "A" magneto no less than 716 limit gauges, made up as follows, are employed:—

Type of Gauge.	No. of Gauges of Different Design.
Plug Gauge	51
Ring "	18
Snap "	71
Plate Gauges—	
Length	12
Height	3
Depth	4
Roller Gauges—	
Height	7
Depth	13
Total	= 179

The gauges itemised above constitute one complete set. Four complete sets of gauges are in use, these being allocated as follows:—

- (1) For Shop use.
- (2) For Shop Inspectors.
- (3) For Government Inspectors.
- (4) For Check Purposes.

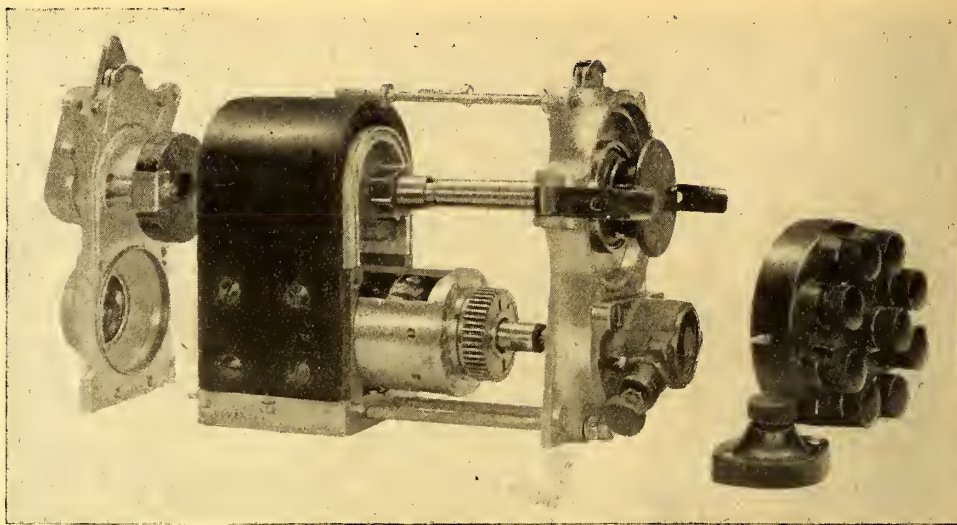
The finer limit gauges are checked in the Tool Room every day, whilst all the other gauges are checked periodically, the frequency of the inspection being dependent upon the degree of accuracy being worked to.

The shop gauges are made to somewhat finer limits than the inspection gauges, so that the rejections made by the Inspection Department are, in consequence, reduced to an absolute minimum.

This method of working has another advantage in that, when the shop gauges become so much worn that they no longer conform to the limits fixed, they are used as inspection gauges and replaced by new shop gauges. Gauges which, after continuous service, become unserviceable for inspection work, of course, have to be scrapped, and the cost of scrapping those gauges which are made to extremely fine limits of accuracy, in consequence of the wear resulting from use, is quite a considerable item.

The finest limits worked to are for the hole in the contact breaker cam and the end of the distributor brush spindle, on which the cam is fitted. These limits are:—

Hole in Cam	Maximum diameter	13.005 mm.
	Minimum	12.995 "
	Tolerance	0.01 "



The 8-Cylinder B.T.H. Magneto, disassembled.

End of Spindle.....	Maximum diameter	12.995 "
	Minimum	12.998 "
	Tolerance	0.007 "

I refer specifically to this one feature of the design so as to dissipate any false notion that the manufacture of magnetos is a relatively easy problem, which may possibly exist in the minds of the uninitiated.

B.T.H. 12-Cylinder Polar Inductor Magneto.

The B.T.H. Co. has recently developed a polar inductor type magneto, more especially for 12-cylinder working, although it is proposed to standardise an eight-cylinder machine of exactly the same design by simply changing the Distributing mechanism, gearing, and contact-breaker cam. I believe I am right in saying that this is the first 12-cylinder magneto to be developed and standardised in this country. Several models have already been constructed and tested with entirely satisfactory results on engines in the test shop, as well as in the air. It is designed to give four sparks per revolution, and the 12-cylinder model runs at $1\frac{1}{2}$ times engine speed.

This magneto is inherently of much simpler construction than the sleeve inductor machine already described, because the sleeve inductor, which by virtue of its design is a very difficult component part to manufacture, is replaced by a polar inductor so designed that it can be easily made, and which at the same time is a more rigid and reliable mechanical structure. Other features in the design combine to greatly simplify the manufacturing problems, and it is anticipated that, other things being equal, the output of magnetos will rise very considerably after the change over from one type to the other has been completely effected—a fact of vital importance at the present critical juncture.

DESCRIPTION OF THE MAGNETO.

The polar inductor consists of a "straight through" shaft made of non-magnetic nickel steel, on to which the two polar inductors are first pressed up against a shoulder, and then finally riveted in position to the shaft. The ends of the magnets are secured to two soft iron pole pieces near the top of each by means of screws. There is an extremely fine air gap between the inside face of each pole piece and the outside surface of the annular portion of the inductor which it surrounds.


The magnet flux, therefore, passes through this fine annular air gap in a radial direction, and flows from one inductor to the other through the laminated armature circuit. The armature windings are carried by a brass spool which is secured to a laminated iron core, which in turn is fixed by means of two clamping screws to upright laminated projections. These are fixed in the central casting which carries the pole pieces, and also provides the base of the machine.

The contact breaker is operated by a four-part cam fixed to the end of the driving shaft. The contact breaker lever is specially designed so as to give a very low moment of inertia, and tests have shown that it will function satisfactorily when making 16,000 breaks per minute. This frequency corresponds to a speed of 4,000 r.p.m.

The distributor is of special design, having three distinct tracks, two of which are the distributing tracks, each provided with six segments. The brush holder contains five carbon brushes, and the safety gap is incorporated in the brush holder and rotates with it. A gauze window is provided in the front of the distributor, and in consequence of the rotation of the brush holder any products of ionisation have an easy chance of escape. This arrangement is much to be preferred to a totally

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enclosed stationary type of safety gap, where the silent brush discharge is always liable to produce injurious results.

SPARKING CHARACTERISTICS AND ENERGY OUTPUT.

The magneto possesses excellent sparking characteristics at low speeds. The energy output, although not abnormally high, is very satisfactory for an inductor type magneto. It should be noted that the maximum energy output which is reached at a speed of about 800 r.p.m. is as large as 0.072 joules.

Special precautions have been taken in the design of the magnetic circuit as well as in the choice of suitable magnetic material to ensure that the effect of eddy current damping is reduced to an absolute minimum. As a result of this, the falling off in the energy output as the speed is increased beyond the maximum point on the curve is not very marked, and for the sake of comparison another curve, which has been plotted from the figures obtained on testing a 12-cylinder polar inductor type magneto of American manufacture, is added. In this case the effect of eddy current damping at high speeds is very pronounced indeed, and the energy output, which reaches a maximum of 0.065 joules at about 800 r.p.m., falls away to only 0.15 joules at 3,000 r.p.m. There is no doubt that by paying more careful attention to the design of the magnetic circuit as referred to above, the characteristic of this particular magneto, so far as energy output is concerned, could be improved.

PRIMARY VOLTAGE AND CURRENT CURVES.

The open circuit voltage curve is practically a straight line passing through the origin, which confirms the view that the eddy current damping in the magnetic circuit is extremely small. With most types of magnetos the open circuit primary voltage curve shows a distinct drop with increase in speed, due to the fact that the active armature core flux diminishes as the speed is raised. This drop is fairly pronounced in the case of the sleeve inductor type magneto already described.

The short circuit current, on the other hand, remains substantially constant for all speeds above about 600 r.p.m., and this test, in which the magneto is run with the primary short-circuited through an ammeter of negligible resistance, is analogous to the case of an alternator running on short circuit. Every electrical engineer knows that in the latter case the short circuit current is practically independent of the speed, due to the fact that the induced E.M.F. in the short-circuited winding varies in almost strict proportion to the reactance of the winding.

PRIMARY VOLTAGE KICK AT "BREAK."

The primary voltage kick at the instant of "break" was determined at different speeds by using a Kenotron in conformity with the method of testing previously referred to. The voltage increased with the speed up to 3,000 r.p.m., very rapidly at first, but not so rapidly at very high speeds. Abnormally high voltages were measured, these being considerably in excess of any figures that I have been able to obtain by testing in the same manner our rotating armature type of magneto. When the ratio between the primary and secondary turns is taken into consideration, one is led to the conclusion that at the instant when the high-tension spark is initiated an abnormally high voltage is induced in the secondary, this voltage being greatly in excess of any figure that has been previously assumed.

I have already discussed this particular aspect of the problem at considerable length, and would simply add, therefore, that this result would seem to lend support to the views which I have put forward. Possibly it affords a clue as to the reason why the polar inductor type of magneto appears to possess certain inherent advantages, so far as the igniting power of the spark is concerned, over the rotating armature type as ordinarily constructed.

"WIRELESS."

THE CALCULATION AND MEASUREMENT OF INDUCTANCE AND CAPACITY.

For those whose work lies in the design of telephone or wireless gear, this book, just published by The Wireless Press, Ltd., Marconi House, Strand, W.C., should be of immense interest, and, in some ways, of considerable use.

Formulae are given for the inductance of the most varied types of circuits, including aërials, single turns, and coils of all types; connections are provided for the use of tape or tube instead of wire, for thickness of insulation, and for end effect. A special section is devoted to the calculation of mutual inductance.

Of these formulae some are purely theoretical, others empirical.

The capacity formulae are equally diverse, the majority being for the exact calculation of aërials of all types. The chapters on measurement are, however, not so useful to the wireless worker, as they are mainly devoted to measurements at telephone frequency: there is still an opening for a work on the practical measurement of wireless inductances and capacities, calibration of high-frequency standards, etc.

The book ends with an excellent set of tables and curves to facilitate calculation.

THE USE AND ABUSE OF STEEL.

On April 11th, Lt.-Col. R. K. Bagnall-Wild, R.E., Chief Inspector, Aeronautical Inspection Department, R.F.C., lectured on "The Use and Abuse of Steel" in Aircraft. In the preparation of the paper, Lt.-Col. Bagnall-Wild was assisted by Lt. E. W. Birch, whose contribution to research into the behaviour of steel has evidently been of very great value.

The lecture was delivered at the Royal Society of Arts to the Institution of Automobile Engineers, but members of the Aircraft Industry were specifically invited to attend, and it is very much to be regretted that so extremely few people connected with aircraft construction were present at the lecture, which was of absorbing interest. Unlike so many lectures on steel, this particular lecture was of an eminently practical nature, and was neither concerned with mathematical theory nor overloaded with the chemist's-shop kind of discussion of material. The ninety-nine decimal nine recurring per cent. of the Aircraft Industry who missed the lecture missed a great deal of extremely valuable information.

One hopes, however, that those members of the Industry who are really interested in their work will endeavour to procure a copy of the paper, which was issued in pamphlet form at the meeting, and will digest the matter therein at their leisure. Applications for copies should be made to Mr. Basil H. Joy, at the Institution of Automobile Engineers, 28, Victoria Street, Westminster, S.W.1. Naturally, no price is given on the pamphlet, as it was issued for the use of members of the Institution, and one might reasonably consider it priceless. One gathers, however, from the Secretary of the Institution, that copies can be procured at the price of 1s. plus one penny for postage. As the pamphlet is illustrated with 13 very interesting and excellently reproduced photographs of the curious behaviour of steels in such things as valves, Gnome cylinders, turnbuckles and crankshafts, it is really remarkably cheap at the price.

One's personal impression was that the paper ought to have been read before the Aeronautical Society, though as a great deal of the subject-matter dealt with aeroplane engines, it was certainly equally apposite that the paper should be devoted on this occasion to Automobile Engineers. One would, however, very much like to hear a similar paper by Col. Bagnall-Wild in which the question of steel in aero-engines was left out entirely and the whole paper devoted to the behaviour of steels, especially heat-treated steels, in such portions of aeroplanes as sheet steel clips, streamline wires, engine back-plates, and steel tube struts, with special reference to the effects of proper and improper acetylene welding in tube and sheet.

Col. Bagnall-Wild referred to the subject of heat-treating steel and to the chemical composition of various kinds of steel, and gave some useful hints on the eccentric behaviour of pyrometers.

The paper was by no means without its humour, as, for instance, the lecturer's reference to the fact that in pre-war days some firms were accustomed, when any process required the heating of steel, to leave it in the hands of a glorified foreman blacksmith who had been brought up on wrought-iron, had learnt a little about mild steel and disliked what he had learnt. In the subsequent discussion, one of the steel experts who spoke expatiated on the merits of a man who was first of all a blacksmith, was then a foreman, and thereafter was glorified. Whereupon Col. Bagnall-Wild modified the phrase into a glorified village blacksmith.

One might, perhaps, suggest that the best type of village blacksmith is one of the most expert metal workers in the world, but on the whole Col. Bagnall-Wild's criticism is justified, because our present horrible industrial state has entirely destroyed the artist-artisan, if he ever existed in this country on a par with the Spanish artists who produced "Toledo blades," or the Arab artists of Damascus, and it has substituted the begoggled chemist and the hot-air scientist. Consequently, one undoubtedly has to rely very largely on applied science, with all its inaccuracies, for the material of to-day, rather than on the personal and individual skill of the artist-artisan who simply knows his job.

The lecturer's remarks on the subject of twisting crankshafts were of remarkable interest, as were his expositions on hair-cracks in steel bars. The flow of steel in valve stampings was also dealt with in a very interesting fashion, as were many points which ought to be part of the knowledge of everybody concerned with aircraft.

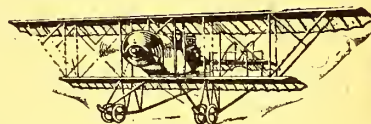
The pamphlet, as issued, contains, in addition to the paper itself, an appendix consisting of "Notes for the Guidance of 'Diluted' Users and Inspectors," which is also of great interest for those who have to deal with Aeronautical Inspectors and diluted labour. One, therefore, cordially recommends not only the men at the top of every aircraft firm to obtain copies of this paper, but also the more brainy members of the staff who are anxious to improve their knowledge of the material with which they have to deal.

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BALLOONS AND AIRSHIPS.

"The History and Development of Balloons and Airships" was the very interesting subject dealt with by Lt.-Col. Waterlow, R.E. (Wing Commander, R.N.A.S.), in his lecture at Cricklewood, on Thursday evening, April 5th.

Mr. Hugh Burroughes, who deputised in the chair for Mr. Holt Thomas, in opening the proceedings, said it was really scarcely necessary to introduce Col. Waterlow, who, as was well known, had been associated with the aircraft movement for a great many years, and he was perfectly sure there was no one who had a better right to speak on the subject of balloons and airships.

Col. Waterlow, after giving a short résumé of the fundamental principle of lighter-than-air vessels, went into the relative values of the gases which could be used for the inflation of airships, explaining that as hydrogen weighed only 5 lbs. per 1,000 cubic feet as against, approximately, 35 lbs. per 1,000 cubic feet of coal-gas, hydrogen was, in all cases where expense was not the primary consideration, used in lieu of coal-gas for the sake of its extra lifting power.

Col. Waterlow gave it as an interesting fact that the first occasion of the use of a captive balloon for military purposes was at the Battle of Fleurus. Captive balloons, he said, were first introduced into our own Army about 1880. They were the smallest and handiest type used in any army, having a capacity of 11,500 cubic feet, and were filled with hydrogen. The envelope was made of gold-beaters'-skin, which was a peculiarly impervious substance, and they were of spherical shape.

These balloons were actually used by us on active service in South Africa, China, and elsewhere. They had the defect, however, he said, that they could not be used in a wind exceeding 20 miles per hour. To obviate this, somewhere about 1905, the kites invented by Mr. S. F. Cody were introduced. These kites required a wind of the strength of not less than 20 miles per hour, and, consequently, between these balloons and kites work could be done in almost any weather. Apropos of the Cody Kite, Col. Waterlow said that to be a pilot on one of these needed considerable strength of nerve, and many aeroplane pilots of his acquaintance had confessed that it was beyond them, a fact which could be quite appreciated from the lantern slide of this form of kite, with which Col. Waterlow illustrated his remarks.

The lecturer then dealt with the Parseval-Siegsfeld kite-balloon, a type which had been adopted by the German, Austrian and Belgian armies before the present war, and by all the remaining belligerents, including ourselves, subsequently.

Col. Waterlow then turned his attention to the non-rigid type of navigable airship, and made use of numerous very interesting slides, illustrating the various kinds of non-rigid airships in use at present and in the past, including the Santos Dumont type, the Gamma, the Eta, and others.

In designing the S.S. ships, Col. Waterlow said, speed of manufacture was of the first importance, and for that reason the fuselages of aeroplanes were converted into airship cars by the simple expedient of removing the wings, elevators and rudders, and slinging what remained beneath an envelope, and as a makeshift this device proved extremely satisfactory.

Col. Waterlow next gave a well-illustrated discourse on the semi-rigid type of airship, and brought his exceptionally fine lecture to a close with an exposition of the rigid type of airship, in the course of which a number of most interesting slides of the series of airships designed by the late Count Zeppelin were shown.

Mr. Hugh Burroughes, in inviting a discussion on the lecture, said that while not wishing to say anything about the Government in regard to airships, he thought it a great pity that they did not go on experimenting with "The Mayfly," as it was rather too much to expect success at the first attempt.

The discussion was opened by Mr. H. Talbot, A.R.C.Sc., B.Sc., who stated that in his opinion the airship in war stood as much chance as the hypothetical celluloid cat chased through hell by the hypothetical asbestos dog, and he personally did not think that airships would survive the present war.

Col. Waterlow, in reply, said that perhaps the simplest answer to Mr. Talbot's criticism was to tell him that practically the whole of his, Col. Waterlow's, service, up to the present time, had been devoted to airships, and he hoped that the remainder would be similarly devoted. With regard to the value of the airship it was only necessary to say that at the outbreak of war this country only possessed, perhaps, five airships, all in a more or less moribund condition, and he was safe in saying that there were now a great number. Similarly, France, Russia and Italy were extremely short of ships at the outbreak of war, but had since been supplied with many naval airships, and, therefore, judging by the demands of the allied Governments, that was the best answer he could give. Germany started with a large fleet, and ever since had worked hard to increase that fleet, and although some people got it into their heads that, because a certain number of these airships had come over here on a

purely military errand and had been destroyed, they were of no use; this idea was quite wrong.

Col. Waterlow added that in his opinion the role of the airship in civilised warfare was purely naval.

Another auditor asked if any experiments had been made in the combination of airship and aeroplane.

Col. Waterlow said that an experiment on these lines had been carried out, but it was difficult for him to say anything about it. In his opinion, however, there was a good deal to be said in favour of such a combination from a military point of view.

Votes of thanks to the lecturer and chairman were enthusiastically carried by those present, and one feels sure that Col. Waterlow will have a record audience at his next lecture, which will take place on April 19th, Mr. Bairstow having changed the date of his lecture to April 12th.—H. H.

STABILITY AND CONTROL.

This lecture was the seventh of the series given at Cricklewood under the auspices of the Aeronautical Society, and was delivered by L. Bairstow, A.F.Ae.S., on Thursday, April 12th. In the absence of Lt.-Col. Mervyn O'Gorman, who had been called away, the chair was taken by Mr. Bertram G. Cooper, A.F.Ae.S.

Mr. Bairstow opened his lecture by a brief review of the previous lectures of the series, which were rounded off, he said, by Capt. Barnwell's lecture on the modern aeroplane. When he said "rounded off," however, he did not mean exhausted.

It is the general rule, Mr. Bairstow said, in all pioneering work, that progress is at first very rapid, and this has shown itself in aviation in the numbers of first-class aeroplanes which have been developed. After the lapse of a period of very rapid progress, however, it is found that very hard work is necessary to make further progress. For instance, it is, he said, very difficult to make a battleship which will do two or three knots more than the best existing type.

Again, iron or aluminium can be obtained with 98 or 99 per cent. purity with comparative ease, whilst 99.9 per cent. is scarcely obtainable even on a laboratory scale. In other words, it is easier to get the first 90 per cent. of the results of experiment than to obtain the last 10 per cent. To such a stage aeronautics appeared to be approaching, and the student who hoped to become a successful independent designer in the future would need to equip himself by very careful training.

As a means of illustrating the principle of the resolution of forces and moments in space, he thought aeronautics offered unrivalled examples which would presently be drawn upon by the Universities and Colleges for examination purposes. The lecturer emphasised the fact that, to the student who wished to become absolutely familiar with the subject of stability and control, mathematical knowledge was important.

Mr. Bairstow contended that, although a student might find it easily possible to grasp the simple physical facts one at a time and gradually be able to consider more than one disturbance at a time, say, for instance, the combined effect of turning, side-slipping and banking, nevertheless, what he did assert was that the full physical knowledge could not be obtained without mathematics.

The subject of stability and control, the lecturer said, follows the consideration of equilibrium. In calculating the performance of an aeroplane the designer assumed steady conditions, the engine running well, the pilot's hand steady on the "joy stick," no wind, and no shaky or loose parts on the aeroplane, and he concentrated on what was the main behaviour of the aeroplane. As a result of his calculations and accumulated experience he will tell you how fast his aeroplane will fly, its greatest rate of climb, its ceiling height, etc., and on the average the aeroplane does what is expected of it.

Mr. Bairstow then gave a concrete example of what happened to an aeroplane when its engine misfired, explaining that, owing to the loss of speed which would ensue, the tail, on a stable machine, would go up without assistance from the pilot, but in any event up it would go, stable or unstable, as the pilot would see to that. The machine would then dive, pick up speed and regain its equilibrium, but either on a descending path or at a new angle of incidence.

Besides the engine, which, Mr. Bairstow said, must be regarded as a control, the pilot could use his elevators, his rudder and his ailerons all independently, and the aeroplane would respond in a different way to each of them.

The air also had its effect; the aeroplane might encounter a head-on gust, an up current, a down current, or pocket or a whirlwind, vertical or horizontal: Under any variation of all these quantities what would the aeroplane do? Was it possible to find out by calculations? The answer was, yes, but if too many things are varied at once the calculations were not short ones.

Instead of indulging, however, in lengthy calculations, Mr. Bairstow showed his audience what an aeroplane would do under certain circumstances by the aid of a number of mica models.

MORE PROOF!

The pilot states that the *Triplex Glass* in his goggles undoubtedly saved his eyes from serious injury, and he mentions that while its immediate surroundings were battered the *Triplex Glass* in the windscreen was undamaged.—*Vide Press.*

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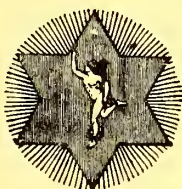
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We were now, he said, so far removed from the early conditions that we were apt to forget the difficulties of the pioneers. At Reims, in 1909, Delagrè had a standard test for weather in which it was safe to fly. Standing in the aerodrome with his feet a little apart he carefully dropped a feather from his finger and thumb about breast high, and if it fell to the ground outside his feet he would not fly. Many of the audience, Mr. Bairstow said, would remember the stir which was made when Latham tackled a 30 mile wind [It was nearer 50 m.p.h.—Ed.] during the flying meeting at Blackpool.

Mr. Bairstow illustrated his remarks with a fine set of lantern slides of both airships and aeroplanes, including a picture of the first really stable machine, in which General Brancker flew from Farnborough to Salisbury with the ailerons and elevators locked and with no other control than that afforded by the engine and the rudder, which latter he worked by means of two pieces of cord passed over his shoulder in the same way that one worked the rudder of an ordinary rowing boat.

In conclusion, Mr. Bairstow hoped that what he had said that night would encourage some, at any rate, of his audience to enter into the great field of investigation opened up by a study of the problems of stability and control.

Hearty votes of thanks to Mr. Bairstow and also to his able assistant (who risked his life by spending most of the evening perched upon two or three tables piled one on top of the other, launching the model aeroplanes), were carried.—H. H

A USEFUL TEXT BOOK.

THE PROPERTIES OF AEROFOILS AND AERODYNAMIC BODIES. BY ARTHUR W. JUDGE. (Whittaker and Co. 15s. net, or 15s. 6d. post free from The Wm. Dawson Publishing Co., Ltd., 2, Breame Buildings, E.C.4.)

The appearance of a whole series of Aeronautical text books—of which this is the second—in the well-known "Specialist" series is a pleasing indication of the growing importance of the aeronautical branch of the engineering profession—and Whittaker and Co. are to be congratulated on their enterprise.

As in his previous volume on the "Designs of Aeroplanes," Mr. Judge has set out to produce a text book which shall provide the enquiring mind with useful and reliable information on the subject under consideration, and avoids carefully any matter of a controversial nature. The reviewer has, therefore, little chance of seriously quarrelling with him.

The book contains a very clear exposition of the general

resistance of moving bodies in a fluid medium, indicating the general effect of variation in the density and viscosity of the fluid in terms sufficiently clear to be appreciated by anyone having a reasonable knowledge of physics. In particular, he is extremely clear on the difference between kinetic and viscosity losses, i.e., bare head resistance and skin friction, and on their bearing on the variation in total resistance coefficients with speed.

Apart from the explanatory theory, Mr. Judge has collected into a very compact and accessible form all the more important data so far published by the N.P.L. and M. Eiffel on the subject of the resistances and forces acting on flat plates, aerofoils, wires, fuselages, struts and other components of the complete aeroplane, interweaving these facts with the previously mentioned theoretical considerations in such a way as clearly to indicate the probable reasons for the apparently widely differing behaviour of fairly similar bodies, and even to those who have no need for the theoretical information imparted, the book will be found extremely useful as a résumé of the best results.

It is to be regretted that Mr. Judge has not included the results of the extremely valuable experiments made by Hunsaker—in particular, those on staggered biplanes with a dissertation on triplanes. As far as this country is concerned, most designers and students have no difficulty in obtaining access to the results of the N.P.L. and Eiffel laboratory tests, while Hunsakers are not sufficiently well known.

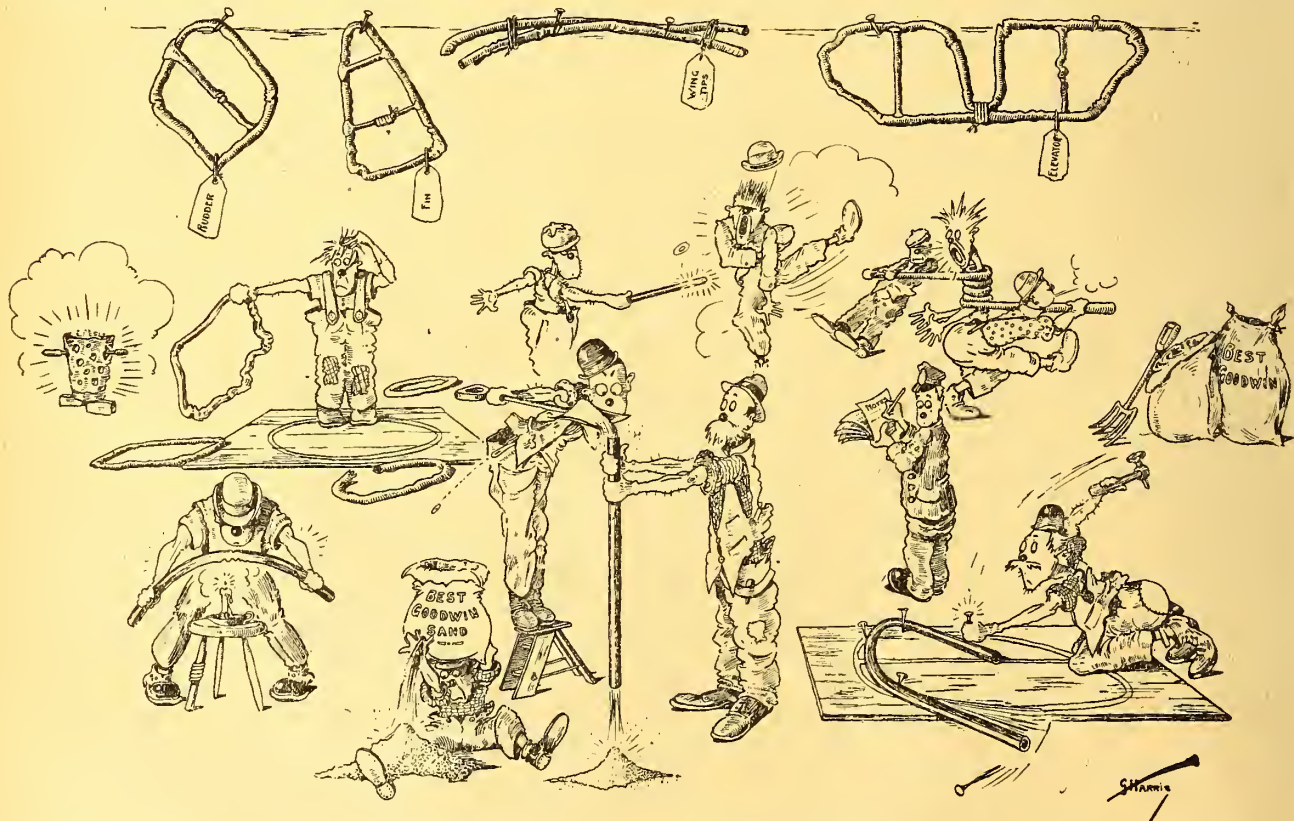
Possibly the most interesting part of this work is that which is left unsaid. On page 92 Mr. Judge says:—

"The author has found it possible to utilise the theoretical methods to evolve aerofoils giving considerably better results than those available at the time. . . . it has been further found quite possible to estimate the lift drift and centres of pressure coefficients with a near degree of accuracy.

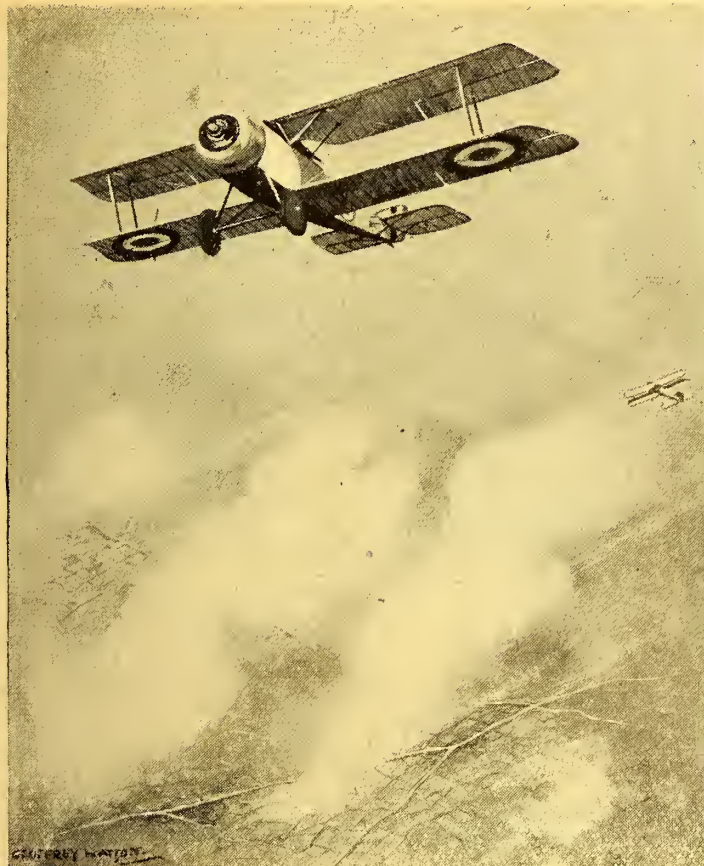
" . . . it may be mentioned that the author has obtained from a model of quite a rational form of wing section, applicable to ordinary aeroplane practice, a lift coefficient of 0.95 at 18 deg. incidence. . . .

"Further, in the case of other models, a lift to drift ratio of over 20 has been obtained for a 1/30 scale model" (at 40 ft. per sec.—Reviewer).

The reviewer happens to have had very similar experiences—and while he can quite understand the reticence of Mr. Judge, he none the less regrets it. However, perhaps at some future date he may be able to compare notes with Mr. Judge.—SLIDE RULE.




SCENES IN AN AIRCRAFT FACTORY.—XIII.—THE TUBE-BENDING SHOP.—In the centre of the picture a worker, steady of hand and eye, endeavours to load a tube with sand ("Best Goodwin," of course), as is usual before bending. He is somewhat thwarted by the fact that his assistant has omitted to plug the other end. His other assistant appears to be perturbed by the loss of Best Goodwin through a faulty bag, and frantically tries to stop the leak with his thumb. On the left, another worker makes futile efforts to produce bending heat with a candle, and on the right, an energetic hand is irritated by the refusal of a partially bent tube to stay put—much to the surprise of an inspector, who duly makes a note of it. Behind them, two skilful benders produce an excellent spiral to the discomfort of a third, who becomes involved in their work. To the left, a careless shop boy presents the wrong end of a heated tube to his unsuspecting superior, and on the left again, a new hand is puzzled as to how to bend a tube to a circle. Hanging on the wall at the back are samples of the shop's work.



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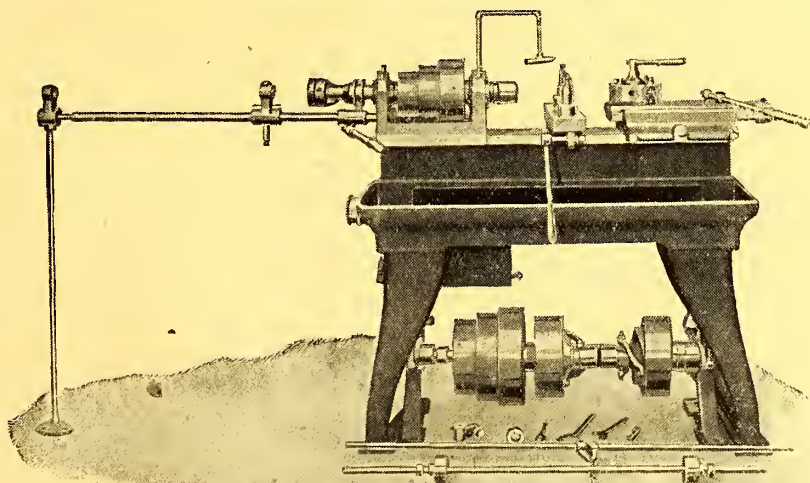
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OXY-ACETYLENE IN THE AEROPLANE FACTORY.

At the present time there are very few factories where the oxy-acetylene system of welding and cutting of metals is not in constant use, and, as a matter of fact, the conditions which the present war has created have proved that the equipment of a factory cannot be considered complete without an installation of this system in some form or another.

With a view to assisting works' managers and engineers who are considering the question of installing an initial plant or extending a system already in use, there is given hereafter some



Fig. 1.—A Small Portable Plant

general information and advice on the selection of suitable plant at the instance of an engineer who has had considerable experience in this branch of industry.

There are two systems of welding and cutting, high and low pressure, but from the point of view of economy in working costs and general utility for factory use, the latter system is the only one which should be considered. The former is only suitable in cases where the necessary plant has to be carried to the job, and where the portability of apparatus is of first importance. In the high pressure system the acetylene is carried in cylinders into which the gas has previously been forced under great pressure. These cylinders are similar to those used for oxygen, and the cost of the gas is necessarily much higher than that produced in an ordinary commercial generator, as is the case in the low pressure system most generally adopted.

THE GENERATOR.

With regard to the acetylene generator, it is important that this should be of strong construction, and the general design as simple as possible. Unfortunately, there are a number of plants

on the market in which everything has been sacrificed to economy, but it is false economy at the best to purchase these. The cost of the most expensive plant on the market is not great compared with other units of an engineering shop, and a few pounds initially saved on a generator may easily be the cause of endless trouble and expense later on.

Generators which have their working parts and control arrangements of over-elaborate design should be studiously avoided.

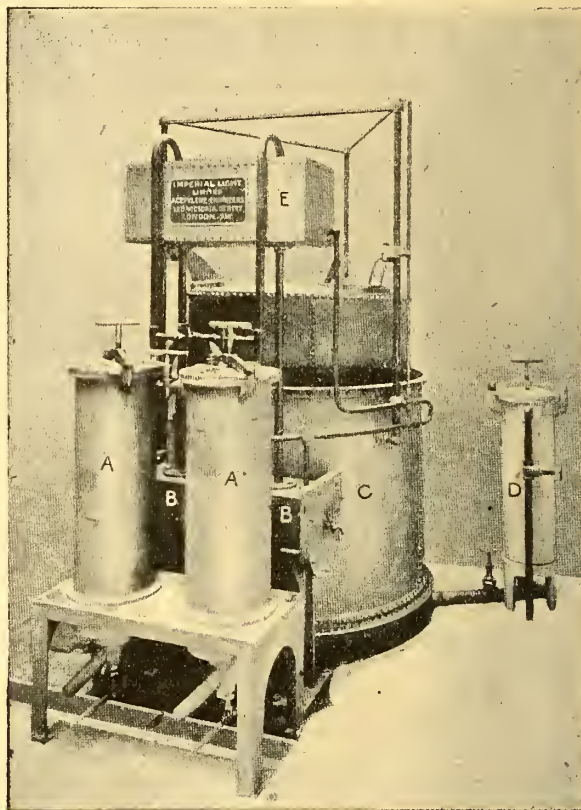


Fig. 3.—A large Fixed Plant.

The most practical generators have all essential parts in easily accessible positions, so that, if necessary, any slight repairs can be immediately put right, without disconnecting the whole of the generator.

In the majority of welding shops a fixed plant is installed, the generator being placed in a suitable shed, and the gas carried by means of iron piping to the welding benches as necessary; in a number of instances, however, it has been found preferable for various reasons to have one or more smaller generators which can be moved about at will to different parts of the works. The choice of a fixed or portable type of plant naturally depends on the requirements of the shop.

The illustrations show the various types referred to. Fig. 1 is a small plant specially designed for carrying about, and as the weight of the whole generator is only about 1 cwt., two men can easily move it about to different points.

The makers' catalogue shows an even smaller plant, weighing less than $\frac{1}{2}$ cwt. A plant of the above description is capable of supplying one blowpipe for welding up to $\frac{3}{8}$ in. or cutting up to 4 ins. in thickness.

Fig. 2 shows one of the smaller types of fixed plants, mounted on a trolley so as to render it easily portable.

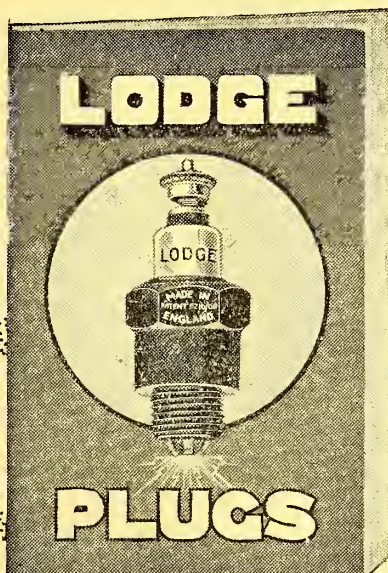
It will be seen that provision is made for an oxygen cylinder and storage bin for carbide on the trolley, so that a complete welding and cutting outfit may be moved about without difficulty.

A plant of this description will run one or more blowpipes, capable of dealing with metal of varying thicknesses, the thickness of the metal, of course, regulating the number of blowpipes which can be used at one time.

Fig. 3 is a general view of one of the larger types of fixed plants installed in shops, where a large number of blowpipes are in use at once. The general working principles of these larger plants are the same as those governing the smaller types as shown in Fig. 2, but they natur-



Fig. 2.—A "Movable-Fixed" Plant.



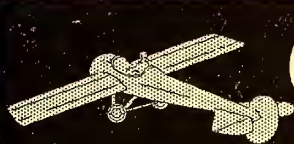
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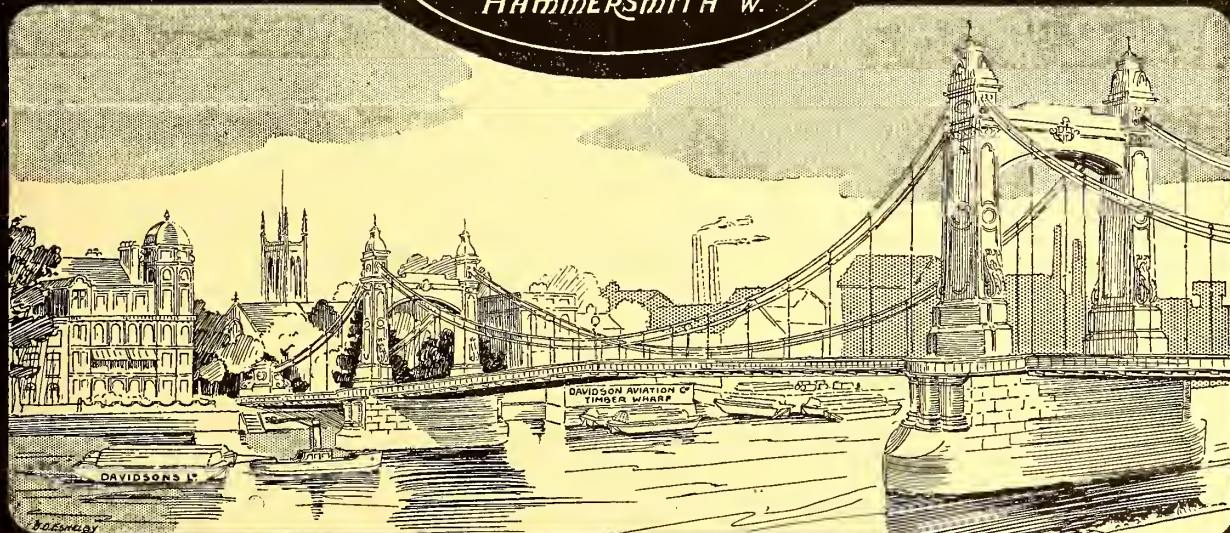
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ally have certain differences in design. In Fig. 3 it will be observed that the carbide containers are in a vertical position and are fed from a separate water-tank, and there is also a separate scrubber or washer for the gas, behind the carbide containers.

In the smaller types the containers are placed horizontally through the gasometer tank, and are fed from the water in this tank. Space and weight are thus economised.

SELECTION OF BLOWPIPES.

A great amount of care should be exercised in the selection of blowpipes as these are quite as important a part of an oxy-acetylene outfit as an acetylene plant. The primary consideration is, of course, their consumption of gas, and this is purely a question of design and careful experimental work on the part of the manufacturers.

The blowpipe should be perfectly balanced and as small as possible consistent with strength and utility; a welder is thus enabled to work for a much longer period without undue fatigue than would be the case if a heavy or badly-balanced blowpipe were used. A well-balanced tool makes all the difference between a good and bad weld. This applies, of course, in a greater degree to works where female labour is employed on light welding work.

OXYGEN REGULATORS.

Oxygen regulators are made in two types, high pressure for cutting and welding work, and low pressure for welding work only. The former are arranged so that the pressure of oxygen can be reduced low enough for welding purposes, or increased to a suitable pressure for cutting, and this is the type most generally used in welding shops, as they are useful for both purposes and the cost is very little more than that of the low pressure type.

It is obvious that it is impossible to economise in the purchase of regulators. These are practically scientific instruments, and have to be made with a greater degree of accuracy than any other accessory used in oxy-acetylene work, and engineers will do well to bear in mind in this instance, as, indeed, in all others, that they get what they pay for. A badly-designed and cheap regulator will not only cause bad work, but be a source of danger.

THE LABOUR QUESTION.

With regard to application, once a system is installed it is a question of obtaining suitable labour for carrying out the required work, and in most cases this can be found among the existing shop hands.

Any man or woman of average intelligence can, after a short period, attain enough proficiency in this branch to carry out at least some of the more simple types of work. In cases where special or intricate work is done, then especially trained, skilled welders are needed.

THE PROPER FLUXES.

In all welding work an important point to be observed is that suitable and satisfactory fluxes are used. They are necessary for all metals, except wrought iron, and once again it is false economy to save in the purchase of these chemicals. A few pence saved on them may easily cause a loss of pounds in spoilt work. There are, as a matter of fact, very few really efficient fluxes at present on the market; some of the most reliable brands are sold by Imperial Light, Ltd., under the name of "Sunflower" fluxes, to which firm, by the way, thanks are due for the illustrations to this article.

MOTOR REPAIR WORK.

There is practically no limit to the variety of uses to which oxy-acetylene can be put, and one trade in particular which has benefited to a considerable extent is the motor trade.

Repairs to motor parts of all descriptions have been and are still carried out, and in these days when spare parts are almost impossible to get, oxy-acetylene welding has nobly "stood in the breach." Fig. 4 gives an illustration of an aluminium crank case

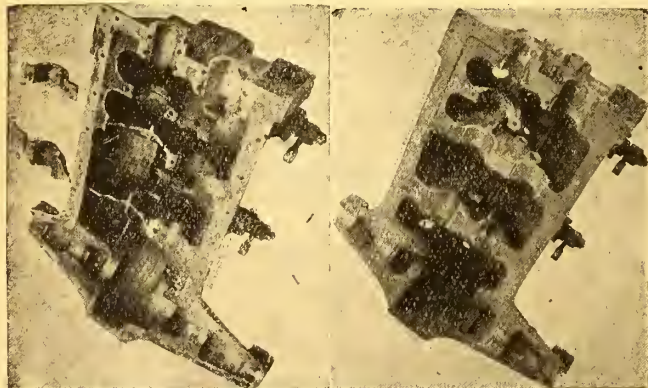


Fig. 4.—A Crank-Case Weld.

successfully repaired by this method, by Imperial Light, Ltd. Aluminium is the most difficult metal there is to weld, and great care has to be exercised to avoid distortion.

CYLINDER WELDING.

The next illustration (Fig. 5) shows a cylinder casting which had all flanges broken completely off, and extending well into the bore. This cylinder was repaired by the same firm. This

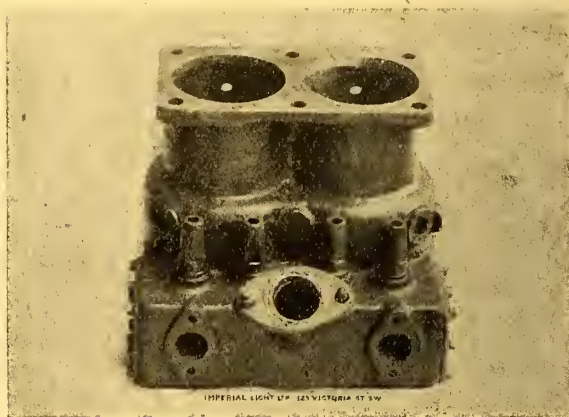
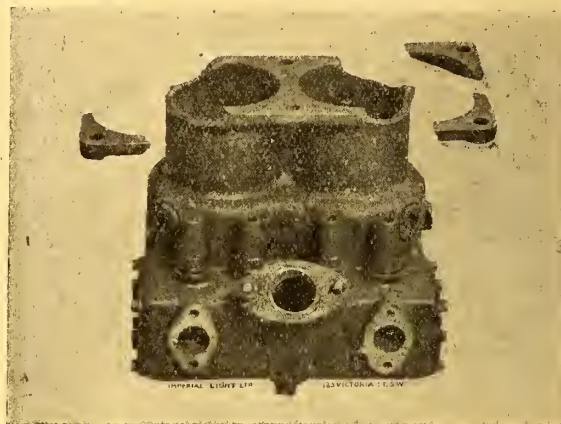


Fig. 5.—Cylinder Welding.

repair was carried out some years ago, and it is stated that the engine is still running with the weld in practically the same condition as when the repair was first carried out. These are only two instances of many thousands of repairs which have been done.

Welding is not confined to repair work only, and the constructional departments of engineering works and especially aeronautical engineering works make large use of this system, which has proved more than ever, since the outbreak of the present war, that it is an indispensable part of the equipment of an engineering shop.

ITALIAN BRAINS IN THE WAR.

A neat new fitting making for economy in motor bearings is the "Argus" automatic switch, worked by the oil pressure—or, rather, by the want of it.

On the (forced) oil-feed failing for any cause, the device cuts out the ignition till the pump is restored to vigour again. For starting purposes the switch's automaticity can be put out of action.

The invention, in brief, merely consists of a diminutive piston inserted anywhere in the lubrication system and bearing, when this is working, on a flat spring through which the primary ignition current flows, both piston and spring being external to the oil-pipe, be it understood.

On the failure of the regular oil "push" the piston, helped by the action of the spring itself, collapses and allows the current to flow to earth. As simple as it is safe, the manufacturers, Messrs. Piumatti and Pagliano, of Turin, tell me. They are known as magneto and dynamo people, so the "Argus" is properly made, and as fitted to dash and instrument boards it is very attractive too.

On Zepp, nights or in the darkened zone it should be a boon. Though not necessarily suppressing the oil-gauge, for lorries and the novices it might well do so. "A stitch in time" is an old proverb quite apt to these hard times. So, too, the price of the "Argus."—T. S. HARVEY.

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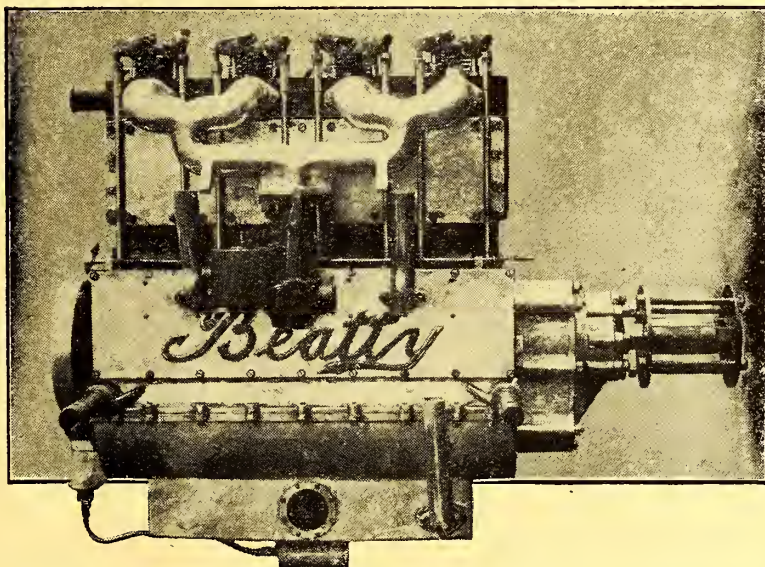
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THE PATENTS INDEX.

The subjoined index of recent inventions has been specially compiled by THE AEROPLANE from the current Official Patent Records.

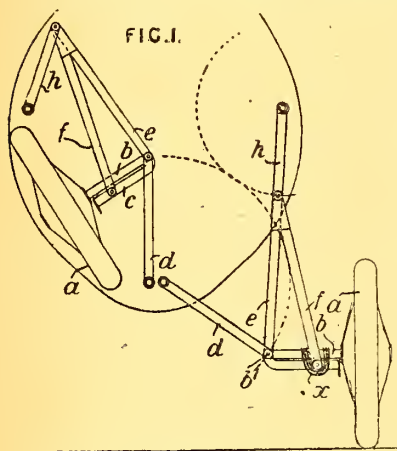
PATENT APPLICATIONS.

- Aeronautical Instrument Co. Captive balloons. No. 4328/17. March 26th.
 Ancot, A. A. P. Aero hydraulic engine. No. 4418/17. March 27th.
 Back, W. E. Flying machine. No. 4469/17. March 28th.
 Cazanave, A. Aeroplanc. No. 4657/17. March 30th.
 Douglas, C. D. Aeroplanes, etc. No. 4636/17. March 27th.
 Liversedge, A. J. Rigid dirigible airship. No. 4596/17. March 29th.
 Liversedge, A. J. Dirigible airship. No. 4597/17. March 29th.
 Longstaffe, B. H. Radial type four-cycle internal combustion engine. No. 4314/17. March 26th.
 Page, F. Handley. Means for supporting bombs, etc., on aircraft. No. 4404/17. March 27th.
 Complete specifications accepted, printed copies of which are obtainable on and after April 19th:—
 104,897. March 17th, 1916. Sunbeam Motor Car Co. Internal combustion engines for aeroplanes.
 104,932. March 27th, 1916. Brockelbank, C. H. Propellers.
 105,036. Oct. 14th, 1916. Deckers, A. A. J. Tubular framing for iron buildings, sheds, and the like.
 105,051. June 19th, 1916. Guyot, H. R. Device for cooling the motors of aircraft.

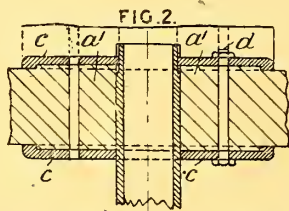
LATEST ABSTRACTS.

17433/15. Aeronautics. BRIEFLEY, W., and VARIOPLANE CO.

Aerial machines adapted to travel also on land; shock of landing, deadening.—A landing-chassis for aeroplanes comprises two parts each carrying a landing-wheel and being adapted to be folded up within the fuselage during flight. Each wheel *a*



is carried by a stub-axle *b* pivoted at *b*¹ to a frame *c, e, f*, which is connected to the fuselage by links *d, h* so that the whole may be folded up within the fuselage, as shown at the left-hand side of Fig. 1. Elastic cables *x* further connect the axle *b* to the frame *c*. Locking devices are provided to retain the chassis in either position. When the width of the fuselage is sufficient, the links *h* may be dispensed with, the frame *c, e, f* being directly pivoted to the fuselage. In a modification, the axle *b* is connected to the frame *c, e, f*

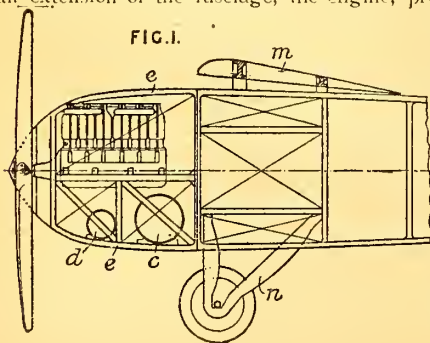


17,434/15. Screw Propellers. JUDGE, A. W., and VARIOPLANE CO.

The blades of aircraft propellers have segmentally shaped roots which are assembled to form a hub. These roots *a*¹ are secured by transverse bolts *d*, which also pass through clamping-plates *c*.

17,437/15. Aeronautics. HOLLE, A. A., JUDGE, A. W., and VARIOPLANE CO.

Propelling; cars; tanks, arrangement and disposition of.—Aeroplanes are provided with a detachable frame adapted to form an extension of the fuselage, the engine, propeller, and gearing,



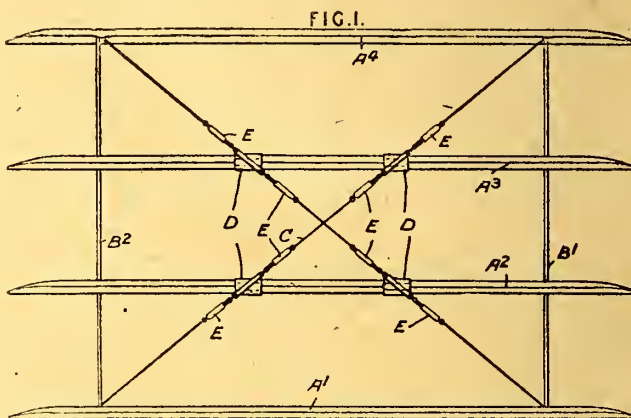
when this is used, being carried by the frame, which may also carry the tanks for petrol and oil and the silencer, so as to form a complete interchange (a, b, c, d) power unit. Fig. 1 shows a casing *e* carrying the engine, propeller, and tanks *c, d*, the casing being preferably enclosed

and conforming to the outline of the fuselage, to which it is adapted to be secured by bolts, etc. The various elements carried in the casing *e* may be adjustable so as not to displace the centre of gravity of the machine when one power unit is replaced by another of different weight.

Planes, arrangement of; aerial machine's adapted to travel also on land.—Instead of adjusting the elements in the casing *e*, the plane *m* and landing-chassis *n* may slide on longitudinal tubes and be clamped thereto in various positions.

17,445/15. Aeronautics. BILLING, N. PEMBERTON.

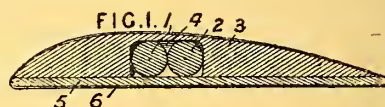
Planes, arrangement of.—Aeroplanes with superposed multiple planes have their intermediate wings carried by diagonal bracing-wires extending between the uppermost and lowermost planes so as to avoid the use of struts and cross-bracing between



adjacent planes. The connection is preferably such as to allow adjustment of the level of the intermediate planes. Fig. 1 shows four superposed planes *A*¹-*A*⁴, the planes *A*², *A*³ being supported by brackets *D* forming parts of ties *C* connected to the ends of struts *B*¹, *B*² extending between the planes *A*¹, *A*⁴. Adjustable screw connections *E* are provided above and below each bracket *D*. The planes *A*², *A*³ may also be connected to the struts *B*¹, *B*².

17,530/15. Aeronautics. SHORT, H. O.

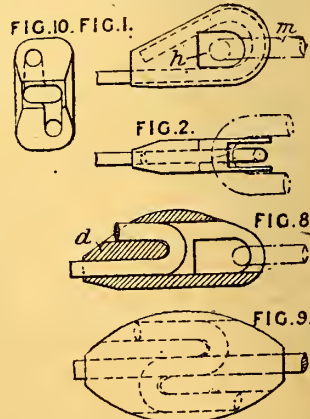
Framework; planes, arrangement of.—Stay wires of aeroplanes or other aircraft are enclosed in casings having the upper surface of streamline form and the lower surface flat and arranged to



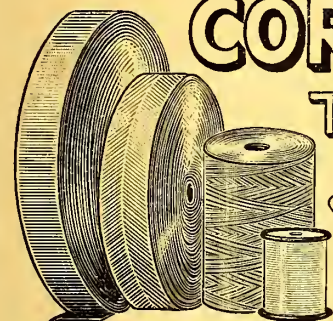
have a lifting effect. Fig. 1 shows two stay wires 1, 2 arranged in a groove 4 formed in a strip 3 of wood, etc., and enclosed by a strip 5 of wood, etc., secured underneath, the whole being covered with fabric 6.

103,701. Wire and like Couplings. VINCENT, E. I. M., and TYLER & CO.

The ends of wires, wire ropes, etc., are connected to other wires, etc., or to end pieces by looping the end of the wire in a casing to afford a connection wherein longitudinal strain is transmitted to the wire through the loop, tending to cause the doubled-over portion to move away from the main portion. According to the invention, the end of the wire is threaded through an integrally-formed cap and back through the cap, so that a loop is formed lying entirely within the cap, and the free end of the wire is prevented from moving away from the main portion of the wire by the side of the casing or of a passage therein. In the form shown in Figs. 1 and 2, a cast or bent sheet-metal cap is open at both ends and closed at the sides and at the top and bottom. The cap has an opening *h* to receive the link *m*. In the form shown in Fig. 8, a U-shaped passage for the wire is formed by a partition *d* integral with the walls of the cast cap. In the form shown in Figs. 9 and 10 for connecting two wires together, a single cap is formed with two partitions constituting two U-shaped passages each receiving a wire.



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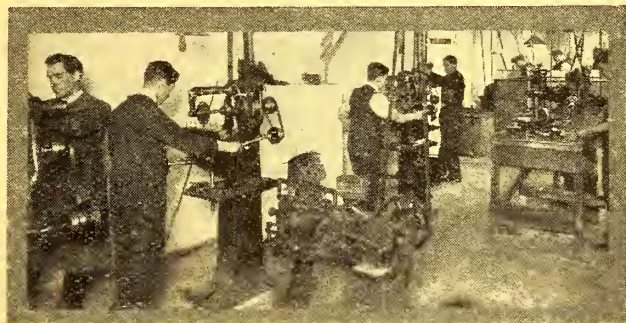
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AERO-MOTORS

IN KIND AND CONSTRUCTION

By Geoffrey de Holden-Stone



THE FONS ET ORIGO.

Success in two-stroker design, as in other things, is born, not so much of the protracted experiment which is only a polite synonym for failure, but of lengthy and reasoned consideration as to why the failure occurred. Failing this, you may go on experimenting for years and still achieve no success.

Hence the importance of being earnest in the conception of ideals as the basis of your work. Never mind any blithering expert who pronounces them impossible. Never let him know about them, or he will discredit them if he can. Better far confide in the next intelligent child—from seven to seventeen, so the better—for a child will readily understand most things, but an expert, never.

That is by the way, but it leads to this, that having conceived the ideal, you will forthwith set about making it a practical possibility. In the course of which, you will, by stage-after-stage consideration, see whether, and how far, the probable results are likely to prove better than what has been already achieved; in other words, whether your ideal is really worth persevering with. Even here, do not be discouraged all at once into abandonment; there is generally "another way," as the excellent Mrs. Hannah Glass frequently remarked in her treatise on pre-war-time menus.

Very early in the proceedings you will find that these considerations have to be much more physical than mechanical: the latter aspect, indeed, being always secondary to the former. That is why two-stroke design is the highest class of i.c. motor engineering.

THE MATTER OF INDUCTION.

Now obviously, in the nature of the proposition, the first essential thing is that there shall be absolutely regular primary induction constant rather than forced, and unaffected by any local condition.

Note here the contrast that in four-stroke design the whole matter of induction stands to be interfered with by all sorts of local conditions such as the design of the manifolds and inlet-passages, the size of the valves, the temperature of the combustion chamber, efficient piston-suction, the adequate disposal of exhaust gases from the previous charge, and so forth.

All these, you will remark, before you can procure the necessary amount of mixture for a given charge, and proceed to deal with it. Thus at the outset, you will wonder—I often have—how any carburettor can manage to deal with these conditions as well as it does. You will readily see, too, how it is that a carburettor which suits one four-stroke motor will not suit another at all. Also, on the contrary, how it is that any old carburettor, the commonest mixing valve, will serve almost any two-stroker.

AND THE TWO-STROKE ADVANTAGE.

Thus you start—with the main advantage of the two-stroke proposition in hand—having all these primary complications of the four-stroker disposed of. There is nothing to hinder your catching your parcel of mixture fairly: just so much of it, neither more nor less, than you calculated for.

But—the further disposal of it, the entire subsequent efficiency of the motor—is to your equation. The primary induction will at least be in constant volume. The suction of the underside of the piston, the entry remote from the cylinder head, assure that, even in a Day-type or Smalley-type two-stroker.

However, we have long since seen that crank-chamber induction, except in a rotary or radial model, is wholly objectionable. Here, then, the consideration becomes solely mechanical. So it may be said at once that of all adjunctory means—one might say essentials—to two-stroke success, the most prospectively useful is the double-ended or differential piston.

THE DIFFERENTIAL PISTON.

This type of piston is usually about twice as long as the

ordinary model, and has its lower end widened and fitted with rings, so as to correspond with an equal increase of the cylinder diameter over its lower part: that is to say, for a length equal to the piston-travel. Consequently, an annular space is formed between the piston-trunk and the wall of this lower half of the cylinder: which, though probably 10 more than an inch wide, will be found to contain a volume equal to that of the working end of the cylinder.

This constitutes one of the few absolute gifts of i.c. motor engineering, and certainly one of the greatest niceties of two-stroke design. For it is obvious that a mere inch width of annular space—all that is necessary in a long-stroke motor, especially when the surface of the piston-extension is slightly sloped to give extra pumping area—will not amount to more than the net diameter of the water-jacketing above; so that there need be no excessive lengthening of the motor-mass. All of which, in fine, is now so clearly recognised that the differential-piston-and-cylinder-combination is the mechanical basis of modern two-stroke design.

The highly debatable point of "prior user" of this form of piston—there are at least half-a-dozen claimants—matters little beside the question of purpose; in which respect all differ; chiefly in regard to its combination in the working cycle.

Thus, as long ago as 1902, A. F. Scott, of Bradford, not only showed this type of piston in various forms in a radial-type two-stroker patent, but also with the piston-trunk recessed so as to constitute a D-valve, as his patent shows. Nevertheless, in both instances the rare—and one would have thought, obvious—possibilities of this latter idea in respect of valveless mixture transference and the elimination of piping, were entirely neglected: were, in fact, sacrificed to the great obsession of exhaust scavenging.

Anyway, nothing seems to have been done with this patent in any of its half-dozen or so of combinations. Probably—since a volume of air from the crank-chamber was pumped in by the differential piston—carburation troubles arose incurably: especially under sudden variations of load, a contingency which any motor must be able to cope with.

These troubles—solely due to mislaid design inspired by the obsession of exhaust-scavenging—arose, for instance, in the "British Duplex" four-cylinder motor, an interesting affair. This motor was skilfully enough designed, but merely as an experiment; and it was left in the experimental stage—very judiciously—by the inventor, for excellent and sufficient reasons, for those concerned to carry on with—if they could.

THE DESERTED ORPHAN.

The motor, however, was not valveless; but the principle of it was that a set of a. o. valves admitted air which formed a cushion in the cross-over transfer passages from the annular pumping chamber of one cylinder to the working chamber of the other, in each pair: the transfer passages in question being formed in a manifold casting.

The cushion of air thus created was supposed to do a certain amount of exhaust-scavenging in the first place, and then to weaken a rich mixture which was further induced from the carburettor. All of which happened as scheduled, on the test-bench. But anywhere else with the a. o. air-valves naturally uncontrollable, and the volume, weight, and velocity of the air constantly varying in their mutual relation the motor simply struck work. The cause of the trouble, and the curc—radical redesign of the physical part of the proposition—were duly indicated. The proprietors, however, and a professional expert, knew better; spent several hundreds more following their own conceits, and finished precisely where they began. It is not clever to get rid of an inventor, halfway through an experimental proposition, especially

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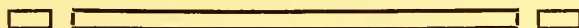
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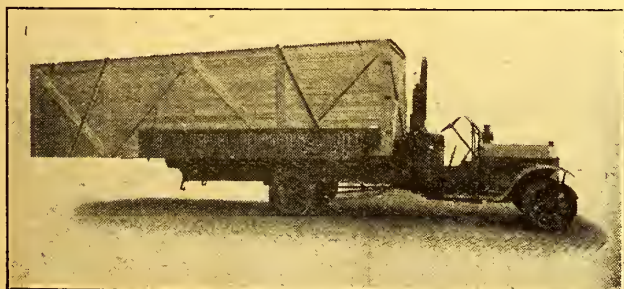
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when he does not happen to have finally determined the relative position of his parts; the main thing in two-stroke design.

THE HEASMAN DESIGN.

W. Heasman, on the other hand, even so long ago as 1904—when he produced his two-stroker at the Noble Motor Co.'s works at Blackfriars—was under no illusions as to exhaust-scavenge, and was, furthermore, perfectly sound as to the best position of the inlet-well above the exhaust.

His model embodied, therefore, the Smalley method of transference to an overhead a. o. valve from an annular pumping-chamber. It was so far successful, that it not only ran at the then very high speed of 1,400 r.p.m.—incredible for a two-stroker—but, on test, showed the extraordinarily low consumption of only 0.55 of a pint per h.p. hour. That is, while it did run; for except at constant speed and load, it would overheat, and, even under those conditions, the consumption of lubricant was on the higher side.

AND WHY IT FAILED.

What was the trouble? Accessory conditions in the shape of rather scanty water-jacketing were none too favourable: but that point could have readily been corrected in a later pattern. The a. o. valves at such a speed were none too reliable; but even so, they were pressure-balanced after all; their design could have been varied; and there was nothing to prevent their being even mechanically controlled in the last resort.

The real defect—utterly unsuspected then by anyone concerned, nor by myself for some years after, during a chance re-examination of the working drawings—was that the exhaust ports were too low down, at the very end of the piston-head's outstroke. Consequently, the exhaust-gas pressure—not so much the exhaust itself—was inadequately relieved, while, at the same time, the differential piston kept pumping in new charges! Added to which, the exhaust-outlet was none too well water-jacketed. It should have had the first of the cooled water, instead of the outlet run.

In fact, this failure affords the most characteristic example imaginable of the delicacy of two-stroke design. Actual pre-ignition did not occur; indeed, could not, from the fact of the overhead a. o. inlet-valve remaining closed by the stronger pressure. The inevitable outcome, nevertheless, was that this promising motor used to overheat, and then gradually slow down.

(To be continued.)

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It is hoped that it will be possible shortly to announce that the new works are in operation, as advantage has been taken of the Easter holidays to transfer large quantities of raw materials from Stratford to Richmond, and it is expected that operations at the new works will commence shortly.

The output at the new works will be many times greater than the output at Stratford, and when it is said that the output of Cellon during the month of March is a record in the annals of the Company, one can more readily appreciate that the possibilities for the new works are enormous.

Cellon, Ltd., state that as hitherto all communications should be addressed to the Head Office, Broad Street House, New Broad Street, London, E.C.2, but in future all empty drums should be returned to Cellon Works, Petersham Road, Richmond, Surrey.

MARKET REPORTS.

Prices given are for quantities on usual terms.

April 12th, 1917.

COPPER.—The market is very steady; in fact, there has been no alteration in prices for a month. The American market is very uncertain, and it is more than likely that there will be an alteration in prices there in the near future.

Current prices: Standard Cash Terms, £136 per ton to-day; Copper Sheets, £174; ditto Tube, 21d. per lb.; Brass Tube, 17½d.; ditto Sheet, 16½d. per lb.

STEEL.—The effect of the increased output mentioned in my report in March 28th issue is now being felt. The present output, compared with the output in August last, shows that enormous increases have been made.

There are more firms taking on the manufacture of Aircraft Steels, and there is every possibility that the present unprecedented congestion of orders will be considerably eased in the near future.

Prices are still very firm; but, if anything, there is an upward tendency.

Current Average Prices: R.A.F. 3A Steel, 36s. per cwt., basis; R.A.F. 1E Steel, 78s.; R.A.F. 9A Steel Sheet, 29s. to 30s.

ALUMINIUM.—As anticipated, the very stringent control of this metal is having a favourable effect on supplies for national needs.

Prices still remain the same.

Official Prices: Ingots, £225; Remelted, £210; Aluminium Sheet 19G, 2s. 10½d. per lb.

TIMBER.—The Director of Timber Supplies is assuming more stringent control of Softwoods. All timber merchants and large consumers of timber must submit a monthly return of all stocks held by them on the last day of each month, the return to be submitted on the 5th of the month following. A special form for this return will be sent to the firms affected by the regulation on or before the 25th of each month. The instructions apply to all firms holding stocks of five standards and upwards. Any firms not receiving the official forms should apply to the Director of Timber Supplies, Caxton House, Westminster.

Any available stocks of timber suitable for Aircraft construction are being very eagerly bought, and buyers should look a long way ahead. Although there are rumours that the Silver Spruce which the Admiralty are importing may be sold to consumers at a lower figure than the present market price, it remains to be seen if the material will be worth buying. It is very inadvisable to rely on the Admiralty shipments until the stocks are actually here.

There appears to be ample stocks of Mahogany.

Current Prices: Silver Spruce, 13s. 6d. to 14s. 6d.; English Ash, 12s. to 13s.; Walnut, 2s. 7d. s.f.; Mahogany Plank, 1s. 11½d. to 2s. 1d. s.f. Prices are for selection and delivery.

FABRIC.—The official control of Fabric does not appear to be working very smoothly. Two months have now elapsed, but both the manufacturers and the mills are still waiting for the official prices to be fixed. Several mills have been delivering material against War Office allocations for the period named, but cannot invoice it, owing to the delay in fixing the price.

DOPE.—It is more than likely that there will be an alteration in supplies of raw materials; if this comes into force, it will have anything but a favourable effect upon prices.

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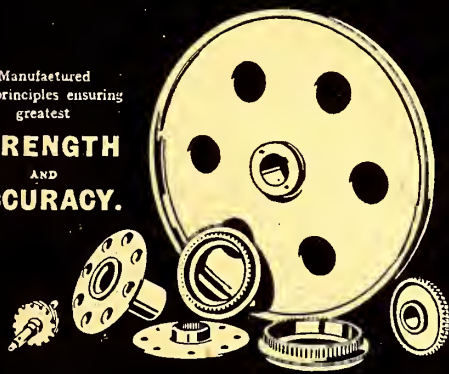
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(Continued from page 968B.)

was severely handled by one of our patrols, who drove down four of the enemy's machines out of control. One other hostile aeroplane was destroyed by us during the day.

Three of our machines are missing.

APRIL 14th, 9.33 p.m.—Yesterday and during the night of the 12th inst. large quantities of explosives were dropped by our aeroplanes with good results on enemy stations, ammunition depots, and aerodromes, and hostile infantry and convoys were successfully attacked with machine-gun fire.

In the course of air fighting behind the enemy's lines four German machines were brought down and six others driven down.

Twelve of our machines failed to return.

APRIL 15th, 9.5 p.m.—Successful bombing raids were carried out by our aeroplanes yesterday, and valuable work was performed in co-operation with our artillery. Severe fighting took place in the air throughout the day.

Four German aeroplanes were brought down, and 11 others were driven down by our machines.

Ten of our aeroplanes are missing.

* * *

WAR OFFICE COMMUNIQUÉS.

The General Officer commanding the British Forces in Mesopotamia reports:—

APRIL 14th.—On the night of the 10th and 11th, our forces made a night march towards the Dila and attacked on the morning of the 11th. Our guns, with the able assistance of our aeroplanes, rapidly asserted their superiority.

* * *

The General Officer commanding the British Forces in Macedonia, reports:—

APRIL 14th.—Our aircraft have carried out several successful raids, on one occasion causing considerable damage to an enemy aerodrome, and on another to an enemy dump. A double-engined enemy battleplane was driven down and its crew captured.

THE CASUALTY LIST.

Reported April 11th.

MISSING.—Brandon, Lt. E. T. C., R.F.C.

Dodson, Lt. L., R.F.C.

Heyworth, Lt. E. L., R.F.C.

Loveland, Lt. H., Canadian Inf., attd. R.F.C.

O'Beirne, Sec. Lt. J. I. M., R. Warwick Regt., attd. R.F.C.

Richards, Sec. Lt. H. S., Sherwood Foresters, attd. R.F.C.

Sayer, Sec. Lt. J. H., R.F.C.

Sharpe, Sec. Lt. S. A., R.F.A., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, BELIEVED PRISONER, NOW REPORTED PRISONER IN BULGARIAN HANDS.—Owen, Lt. J. C. F., Canadian A.S.C., attd. R.F.C.

KILLED.—R.F.C.—Evans, 8369 1st Cl. Air Mech. A. W. (Cople).

DIED.—R.F.C.—Brooks, 1129 Sgt. S. (Swainhill)

Reported April 12th.

PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF WOUNDS.—Collins, Sec. Lt. A. D., R.F.C.

DIED OF WOUNDS.—Grattan-Bellew, Maj. W. A., M.C., Connaught Rangers, attd. R.F.C.

WOUNDED.—Baillie, Lt. W., R.F.C.

WOUNDED AND MISSING.—Hyde, Sec. Lt. E. P., Cheshire Regt. and R.F.C.

MISSING.—Denison, Sec. Lt. N. C., King's Own (Yorks L.I.) and R.F.C.

Margoliouth, Sec. Lt. A. H., King's Own (Yorks L.I.) and R.F.C.

Russell, Sec. Lt. P. A., Cameron Highlanders and R.F.C.

Reported April 13th.

MISSING.—Adams, Lt. A. T., Wiltshire Regt., attd. R.F.C.

Birks, Lt. N. A., R.F.C.

Blackburn, Lt. H. D., R. Berks. Regt., attd. R.F.C.

George, Lt. H. D. K., R. Dublin Fus., attd. R.F.C.

McDonald, Sec. Lt. D. P., Cameron Highrs., and R.F.C.

Proud, Sec. Lt. J. R. S., R.F.C.

Robinson, Capt. W. L., V.C., Worcester Regt., attd. R.F.C.

Ross, Sec. Lt. J. K., R.F.C.

Stewart, Lt. D. J., York and Lanc. Regt., attd. R.F.C.

Thornton, Sec. Lt. C. P., Liverpool Regt., attd. R.F.C.

Townsend, Lt. E. J. D., R.F.A., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—March, Lt. C. H., R.F.A., attd. R.F.C.

KILLED.—R.F.C.—Bastable, 1224 Sgt. W. E. (Swanage).

WOUNDED.—R.F.C.—Richman, 61852, 2nd Cl. Air Mech. W. H. (Derby).

PREVIOUSLY MISSING, NOW REPORTED DIED AS PRISONER IN TURKISH HANDS.—R.F.C.—Reid, 862 Cpl. A. (Castleton).

CANADIAN CONTINGENT.—KILLED.—Evans, Lt. H. H., Canadian Mounted Rifles, attd. R.F.C.

MISSING.—Elsley, Lt. L., Canadian Gen. List, attd. R.F.C.

Reported April 14th.

WOUNDED.—Strickland, Sec. Lt. H. C. W., E. Surrey Regt., attd. R.F.C.

Walter, Sec. Lt. D. P., R.F.C.

Wright, Major A. C., R.F.C.

MISSING.—Blake, Sec. Lt. J. E., R.E., attd. R.F.C.

Brown, Sec. Lt. A. R., R.F.A., attd. R.F.C.

Campbell, Sec. Lt. C. St. G., R.F.C.

Davies, Sec. Lt. R. W. M., Northumberland Fus., attd. R.F.C.

Day, Lt. W. L., R.F.C.

Edwards, Capt. D. W., M.C., A.S.C., attd. R.F.C.

Hume, Lt. R., R. Fusiliers, attd. R.F.C.

Pell, Sec. Lt. H. S., R.F.C.

Pepper, Sec. Lt. A. C., R.F.C.

Rickards, Sec. Lt. A. R. M., R.F.C.

Sequin, Sec. Lt. U. H., R.F.C.

Smith, Sec. Lt. R., Yorks L.I., attd. R.F.C.

Whitaker, Lt. V. J., Lincoln Regt., attd. R.F.C.

MISSING.—R.F.C.—Shepherd, 1054 Flt. Sgt. A. G. (Wolverhampton).

Reported April 16th.

KILLED.—Jones, Capt. G. J., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—

Clark, Sec. Lt. L. L., R.H.A. and R.F.C.

Phillips, Sec. Lt. N. A., R.F.C.

DIED OF WOUNDS.—Boustead, Lt. H. A. R., Middlesex Regt. and R.F.C.

Finlayson, Sec. Lt. A. C., R.F.C.

Hamar, Lt. A. J., R.F.C.

Kent, Sec. Lt. E., Essex Regt., attd. R.F.C.

Myburgh, Sec. Lt. J. A., R.F.C.

WOUNDED.—Barratt, Sec. Lt. R. H., Middlesex Regt., attd. R.F.C.

Brookes, Sec. Lt. G. E., R.F.C.

Dowland, Sec. Lt. L. J. S., Yeomanry and R.F.C.

Farrow, Sec. Lt. W. H., R.F.C.

Glinn, Sec. Lt. W. W., R.F.A., attd. R.F.C.

Grant, Lt. R. MacK., Canadian Gen. List, attd. R.F.C.

Latham, Sec. Lt. R. H., R.F.C.

Lawson, Sec. Lt. S., R.F.C.

Manby, Lt. R. A., R.F.C.

Travers, Sec. Lt. C. T., Wiltshire Regt., attd. R.F.C.

MISSING.—Bailey, Lt. C. F., London Regt. and R.F.C.

Bevington, Lt. R. J., R.F.A., attd. R.F.C.

Boldison, Sec. Lt. A., Lincoln Regt., attd. R.F.C.

Burrill, Lt. T. F., Yeomanry and R.F.C.

Cooper, Lt. H. A., London Regt. and R.F.C.

Hall, Sec. Lt. C. S., R.F.C.

Hatch, Lt. G. J., London Regt. and R.F.C.

Henry, Lt. F. R., Canadian Gen. List, attd. R.F.C.

Higginbottom, Sec. Lt. F., Cheshire Regt., attd. R.F.C.

Jennings, Capt. A., R.F.A., attd. R.F.C.

Knight, Lt. O. R., Queen's (R. W. Surrey Regt.) and R.F.C.

Lecker, Sec. Lt. A. N., R.F.C.

McCallum, Lt. A. H. K., Canadian Gen. List, attd. R.F.C.

Marshall, Sec. Lt. J. A., Cyclist Bn. and R.F.C.

Milot, Maj. J. A., Canadian Gen. List, attd. R.F.C.

Morris, Sec. Lt. V. C., Army Cyclist Corps, attd. R.F.C.

Smart, Sec. Lt. G. O., R.F.C.

Tasker, Sec. Lt. W. T. B., R.F.C.

Truscott, Sec. Lt. F. G., M.C., Suffolk Regt. and R.F.C.

Warburton, Sec. Lt. E. D., R.F.C.

Warren, Sec. Lt. A. P., R.F.C.

Wedderspoon, Lt. J. H. B., R.F.A. and R.F.C.

Wordsworth, Sec. Lt. J. C. D., Durham L.I. and R.F.C.

CORRECTION.—Cooper, Sec. Lt. J. S., R.F.C. (reported killed),

should read:—Cooper, Lt. J. S., R.F.C.

Reported April 17th.

KILLED.—Burke, Lt.-Col. C. J., D.S.O., R.I. Regt., attd. E. Lancashire Regt.

Collins, Lt. H. G., R.F.C.

Moyes, Sec. Lt. W., R. Scots and R.F.C.

DIED OF WOUNDS.—Emmerson, Sec. Lt. A., Leicestershire R. and R.F.C.

Hampson, Sec. Lt. H. N., S. Lancs. R. and R.F.C.

Horner, Sec. Lt. K. C., W. Yorks R. and R.F.C.

WOUNDED.—Anstey, Sec. Lt. A. B., R.F.C.

Hogan, Sec. Lt. P. L., Liverpool R., attd. R.F.C.

Hyde, Lt. E. L., R.F.C.

Norwood, Lt. O. D., R.F.C.

MISSING.—Bell, Sec. Lt. E. V. A., Hampshire R., attd. R.F.C.

Berry, Sec. Lt. O. W., K.O.S.B., attd. R.F.C.

Birch, Sec. Lt. D. C., Northampton R., attd. R.F.C.

Bousfield, Lt. J. K., M.C., R.E., attd. R.F.C.

Butler, Sec. Lt. L., Yorks L.I. and R.F.C.

Cooksey, Sec. Lt. H. B., R.W. Kent R., attd. R.F.C.

Cooper, Sec. Lt. S., R.F.C.

Evans, Lt. B., R.F.C.

Everingham, Sec. Lt. G., R.F.C.

Hamilton, Sec. Lt. H. D., R.F.C.

Heagerty, Sec. Lt. J. F., East Kent R., attd. R.F.C.

Hervey, Sec. Lt. H. E., M.C., R.F.C.

Knowles, Capt. M. B., London R. and R.F.C.

Lewis, Sec. Lt. M., R.F.C.

Smyth, Sec. Lt. E. B., R.F.C.

PERSONAL NOTICES.

DEATHS.

ANDERSON.—Lt. William Trevor Anderson, Lt. Seaforth Highlanders, attached R.F.C., who died on Easter Sunday, at a hospital in Newcastle-on-Tyne, from illness contracted while on military duty, was the younger son of William and Edith Anderson, of Colombo, Ceylon, and Springfield House, Elgin. He was 20 years of age.

BOUSTEAD.—Lt. Harry Atheling Russell Boustead, who died from wounds on April 5th, was the fourth and youngest son of John Melvill and Leila Bousfield, of Colombo, Ceylon, and of Westfield, Wimbledon Common. He was educated at Harrow, where he reached the sixth form, and was a monitor and head of his house, and at University College, Oxford. He won the 100 yards swimming race for Oxford v. Cambridge in 1913, and took honours in history in June, 1914.

On the outbreak of war he obtained a commission in the 2/8th Middlesex Regt., of which his elder brother also became an officer. He saw active service with this battalion on the Western Frontier campaign in Egypt against the Senussi. When the battalion returned to Europe he became attached to the R.F.C. He obtained his "wings" after a month's training, and was sent to the front in October last. He lately brought down two German aeroplanes at the front in one day. Mr. Boustead flew the Channel with a new machine a few days before his death, and lost his life in a fight with an enemy machine on April 5th, in which his observer was instantly killed.

Though mortally wounded himself, he succeeded in recrossing our lines, and brought his machine down successfully on our side. He died a few hours afterwards. His Squadron Commander writes:—"We have lost a very gallant officer. He has taken part in numerous hard-fought encounters with hostile machines, and has always fought with great gallantry. I have forwarded his name to higher authorities for exceedingly gallant conduct."

BRANDON.—Lt. E. T. C. Brandon, Royal Sussex Regt., attached R.F.C., killed on April 3rd, was the elder son of Mr. and Mrs. Fred Brandon, of Natal, and was 22 years old. He was born and educated in South Africa. After going through the campaign in German South-West Africa, he came to England for the first time in Nov., 1915, and received a commission in the Royal Sussex Regt. on Jan. 25th, 1916. In June last year he transferred to the R.F.C., and left for the front in September. He was promoted lieutenant last February.

BURKE.—By the death of Lieut.-Col. C. J. Burke, D.S.O., Royal Irish Regt., British military aviation loses another of its pioneers. As a captain R.I.R. Colonel Burke joined the old Air Battalion R.E., and learned to fly in 1911 on a Farman biplane in

France. When the Royal Flying Corps was formed in 1912, Captain Burke, promoted to temporary Major, took command of No. 2 Squadron, then to be stationed at Montrose, and with that Squadron made many notable flights. Several journeys were made between Farnborough and Montrose, and during the Irish manoeuvres of 1913 the whole squadron flew from Montrose right across Scotland, the Irish Channel, and Ireland itself to the County Limerick. There it assisted at manoeuvres, and eventually flew home again. This was the greatest squadron flight ever made at the period, with, perhaps, the exception of one or two German performances of about the same date. The C.O. was promoted to Major by brevet on June 3rd, 1913.

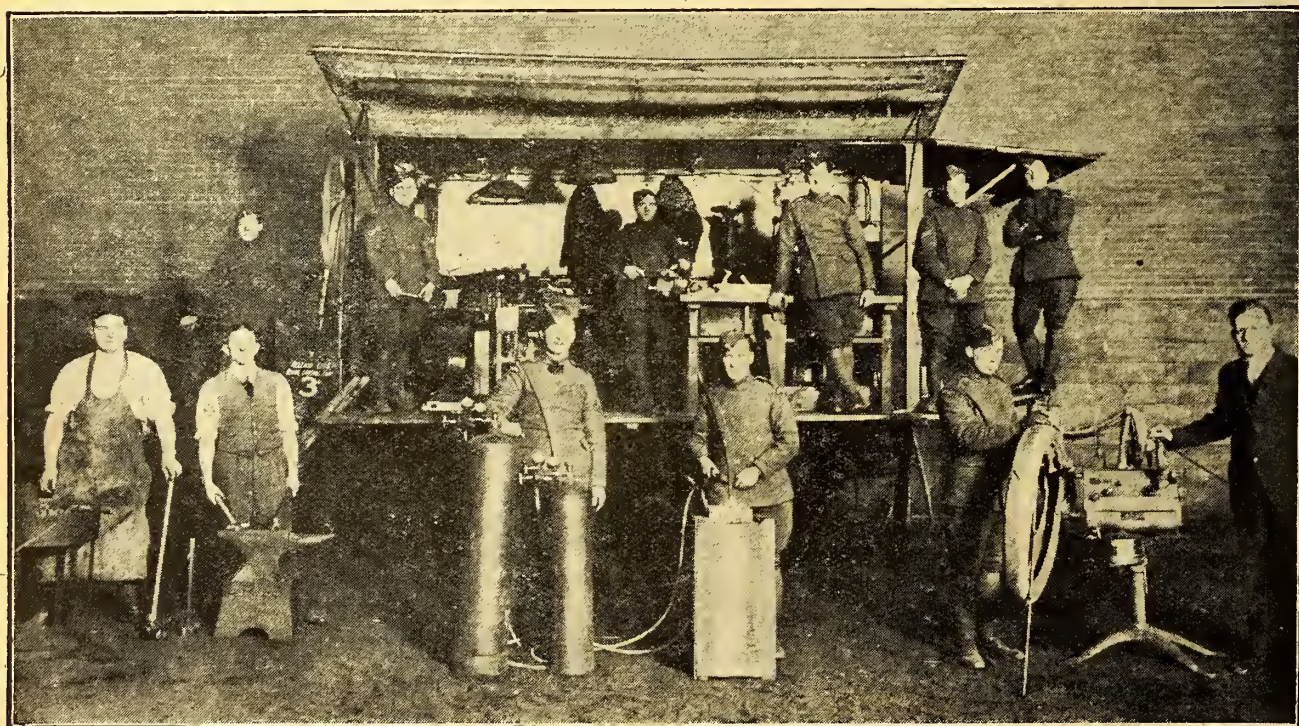
On the outbreak of war, No. 2 Squadron went to France with the rest of our little aeroplane force and acquitted itself as gallantly as the other squadrons, which is to say that it was unsurpassed by any unit in the Army. As the R.F.C. grew, the flying officers of No. 2 became Squadron Commanders, the Flight-Commanders became Wing Commanders, and two of them, Generals Longcroft and Becke, are already Brigadier-Generals. Major Burke, as he was when war began, soon became a Wing-Commander and Lieutenant-Colonel, and was awarded the D.S.O. for services in the field.

With this rank he was Commandant of the Central Flying School during 1916, but towards the end of the year he went back to the infantry, and later took command of a battalion of the East Lancs., which he led when he was killed in action, as recorded in the Casualty List, published on April 17th.

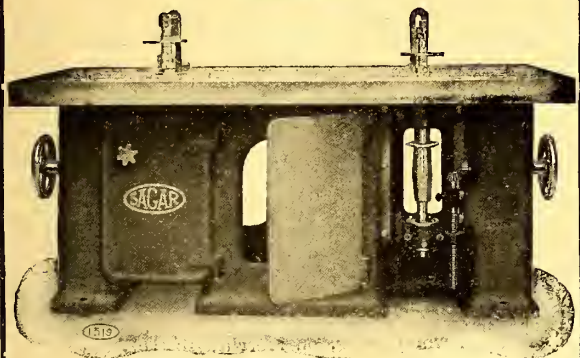
Charles James Burke was the third son of the late Michael Charles Burke, of Armagh, and was thirty-five years of age when he died. He received his commission in the Royal Irish in 1903, and wore the Queen's South African medal with two clasps. Besides winning special promotion to Major by brevet before the war, and the D.S.O. during the war, he was mentioned in dispatches on more than one occasion.

Colonel Burke was a genuine Irishman of his particular type. Of large and burly build, he acquired in the R.F.C., which was originally supposed to consist of small, light men, the nickname of "Portly Percy," but, nevertheless, he was, in his day, quite a good pilot, though, becoming a field officer early in his connection with the Corps, his duties prevented him from doing much flying.

He had the real Irish sense of humour, and I well remember his telling with joy, on returning from leave, how one of his horsey friends at home, regarding him as something of a lunatic for flying, and yet, Irish-fashion, wishing to be civil, remarked of his experiences as an aviator, with special reference to a splendid crumpler which he had come with the first military Farman; "Ah! well! I suppose it's grand thrainin' for the huntin'." The idea that flying was merely a useful method of keeping one's eye in during the summer for the real business of the year, commended itself greatly to the pioneer aviator.



The R.F.C. Recruiting Party in Toronto are here seen with their travelling workshop and the accompanying appliances with which would-be air-mechanics are tested at their trades. One perceives a brazing-hearth, an anvil, an acetylene welding plant, and a vulcanising plant in the foreground. The turning tests are apparently done in the wagon, and one is inclined to wonder whether accurate turning is produced on so vibratory a base as the floor of a sprung wagon with rubber tyres.



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All the old-timers who knew Colonel Burke in the early struggling days of the Air Battalion, before it became the Corps d'Elite and a popular idol, when his hearty manner and good humour did so much to cheer the life of those who served with him, will deeply regret his death, and will offer their respectful sympathy to his widow and family.

CODY.—According to the French technical journal, "L'Aérophile," the late Sec. Lt. Frank Cody, R.F.C., whose death has already been recorded, was killed in an aeroplane accident. "L'Aérophile" also states that Mr. Cody had destroyed five German aeroplanes on the Western front.

COLLINSON.—Lieut. George Edward Cleather Collinson, Queen's Own Cameron Highlanders, att'd. R.F.C. (died on April 13th from the results of a flying accident), was only son of the late George Cleather Collinson and of Mrs. Collinson, of Foulis Terrace, Onslow Gardens. His lieutenantcy was gazetted in March of last year, and in the following November he was appointed flying officer, R.F.C.

HAMPSON.—News has been received that Lt. Harold Norman Hampson, R.F.C., died of wounds on April 7th. He went to the front as a piper in the Liverpool Scottish, and after being wounded, joined the Inns of Court Officers Training Corps, and received a commission in the South Lancashire Regiment.

In Feb. last he was transferred to the R.F.C. On April 11th a letter was received from him stating that he had on April 6th been successful in shooting down two enemy aeroplanes. He was in his 21st year.

HARE.—Sec. Lt. E. J. Hare, R.F.C., was a member of the South African Civil Service Department of Railways and Harbours. He was well known in the Transvaal and Western Province of Cape Colony as a fine athlete, sprinter, and Rugby footballer, and he played in first-class football in Pretoria and elsewhere.

After the Union Defence Force was established he was selected from a large number of volunteers to learn flying, and he qualified at the S.A. Aviation School at Kimberley. He came to England with the original South African Oversea Contingent as a dispatch-rider in the S.A. Signal Company, R.E., in which his high spirits and cheerful temperament made him very popular. In October of 1916 he transferred to the R.F.C. He had all the qualities for a fine aviator, and fought in several aerial combats with great boldness and success, and was soon granted a commission in the R.F.C.

HORNER.—Sec. Lt. K. C. Horner, R.F.C., died of wounds, was the only son of Mr. and Mrs. C. R. Horner, of Monkbridge Road, Headingley, Leeds. He was 20 years of age, and at the outbreak of war was at the Leeds Grammar School. Mr. Horner had been flying at the front for three weeks when he received the wounds from which he has since died.

HOWELLS.—Sec. Lt. Hugh Howells, R.F.C., was flying in an eastern county on April 10th at a rather low altitude, when his machine fell, struck the corner of a building, and burst into flames. The officer died during the night.

KIRKUP.—On April 12th at a hospital in the Lincoln district an inquest was held on the body of Capt. Philip A. Kirkup, R.F.C. He was practising attacking at about 1,000 ft., when the machine got into a spin and crashed to the ground. Capt. Kirkup was an experienced pilot, and had flown in France as an observer. He was 23 years old. A verdict of "Accidental Death" was returned.

LUKYN.—Capt. Stanley Edward Lukyn, M.C., Queen's Regt. (Royal West Surrey), attached R.F.C., who has died from injuries received in an accident while flying, was the second son of Herbert and Edith Lukyn, of Sunbury-on-Thames. He was 22 years of age.

At Marylebone, on April 13th, an inquiry was held concerning the death of Capt. Lukyn, who died in the Royal Flying Corps Hospital at Bryanston Square.

His mother stated that her son had been learning flying for 10 days, and had been up on several occasions.

Major Macdonnell O'Malley said the greatest care was taken with every flying pupil, and only expert flyers were sent up to give instruction. Capt. Harrison, the pilot and instructor on this occasion, was an expert, with experience in France and England. The machine in which he and Capt. Lukyn were flying was a brand new one and had only been in use for 10 days.

The inquiry was adjourned until June 4th for the attendance of Capt. Harrison, who is in hospital suffering from severe injuries.

MILNE.—Major William Milne, M.C., L. N. Lances, att'd. R.F.C., who was accidentally killed in England on April 13th, was the youngest son of James Milne, Esq., Chamadaska, B.C.

MYERS.—Sec. Lt. F. M. Myers, M.C., Suffolk Regt., attached R.F.C., who was killed in action on Feb. 14th, 1917, was the only son of B. C. and Ethel Myers, of Johannesburg, South Africa. He was 21 years of age.

NORTON.—Lt. Hugh Norton, R.F.C., killed in action, aged 24, was the son of Mr. David Norton, of Engedi, Eastbourne, and was educated at the Grange, Eastbourne, and at Wellington College, where he was in the O.T.C. and the "Shooting Eight." After passing two examinations in Chinese at King's College, he was about to go to the Far East for Dodwell and Co., Ltd., when war broke out. He joined the Inns of Court O.T.C., and obtained a commission in the Royal Lancaster Regt., and saw service as a signalling officer in France and the Balkans.

After subsequent service in Egypt he was attached R.F.C., and had been at the front about three weeks when he was killed. His Flight Commander looked upon him as "one of his most promising pilots, who had shown great keenness."

STRETTON.—Lt. Sidney Stretton, R.F.C., who died of wounds received while flying, on March 27th, was the eldest son of the late Mr. Benjamin Stretton and Mrs. Stretton, of Hammerwich House, near Lichfield, and was 28 years of age. He was in India as representative of the Daimler Company when war broke out. While in that country he joined the Calcutta Light Horse.

Returning home in May, 1915, he obtained his commission in the R.M.A. early in June and went to the front in the following Dec. In March, 1916, he transferred to the R.F.C. as an observer, and was wounded on Aug. 2nd while flying over the enemy's lines. He obtained his pilot's certificate in March this year and left England on March 25th.

TAGENT.—Sec. Lt. H. W. Tagent, R.F.C., killed in action in France, March 24th, 1917, was aged 22. He was the only son of Mr. and Mrs. G. A. Tagent, Winchmore Hill, London, and was educated at Cliftonville College.

When war was declared, he volunteered for service, joining a Public Schools' Battalion. He obtained his commission in 4th Royal Irish Fusiliers in May, 1915, and was attached Royal Flying Corps in February, 1916, when he soon obtained his wings and was sent to the front.

His Commanding Officer writes: "He was taking photographs over the German lines when he was attacked by a German machine, and after a gallant fight was shot down, both he and his observer being killed, the machine falling on our side of the lines. I cannot possibly express my feeling over this misfortune, as your son was quite my best photographer, and one of the most courageous and skilful of all my pilots. Both myself and the other officers of your son's flight mourn the loss of a gallant comrade and friend."

TAYLOR.—Capt. Henry Arthur Taylor, M.C., Royal West Kent Regt., attached R.F.C., was educated at Charterhouse and Sandhurst. He went to the front at the end of April, 1916, and joined the R.F.C. In August he was awarded the Military Cross for "conspicuous gallantry when on a bombing raid in unfavourable weather; he descended to less than 1,000 ft. and bombed a train, derailing several trucks." On Sept. 25th, 1916, he was promoted temp. Capt. and Flt. Commander. On Sept. 27th he was shot down while leading a patrol against a largely superior enemy formation. Capt. Taylor was the elder son of Mr. and Mrs. F. H. Taylor, of Wimbledon, and was only 18 years of age.

WILLIAMSON.—Lt. John Alexander Williamson, R.F.C., killed while flying in Leicestershire on April 10th, was the eldest son of Mr. John James Williamson and Mrs. Williamson, a daughter of the late Mr. Martin de Bartolome, and was 21 years of age. He was educated at Rose Hill, Tunbridge Wells, and Charterhouse, leaving in July, 1914. He obtained a commission in Sept. following in the Royal East Kent Mounted Rifles, and went with them to Gallipoli, remaining there till the evacuation, when he went to Egypt, and became attached to the R.F.C. He returned to England last August, and after qualifying as a pilot went to the front.

ENGAGEMENT.

HOOPER—HALL.—The marriage between Capt. C. A. Hooper, R.F.C., youngest son of Mr. and Mrs. H. S. Hooper, of Shenstone, Lichfield, and Janet Ashley, only daughter of Mr. and Mrs. J. A. Hall, of Westbury-on-Trym, Bristol, will take place quietly at Henbury on April 19th, at 2 p.m.

MARRIAGE.

ROBINS—GORDON.—On April 10th, at Christ Church, Doncaster, Kenneth Robins, E. Surreys and R.F.C., was married to Beatrice Mary Gordon.

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BIRTHS.

COLLINS.—On April 7th, at Wye College, the wife of Lt. C. Hart Collins, R.F.C., of a son.

RODWELL.—On April 10th, at The Towers, Market Drayton, the wife of Capt. (temp. Major) R. M. Rodwell, W. Yorks Regt. and R.F.C., of a son.

STEWART.—On Tuesday, April 10th, at 12, Regency Square, Brighton, the wife of Lt. Stewart, R.F.C., of a daughter.

TEAGE.—On April 10th, at 4, Spencer Road, Coventry, the wife of Capt. H. D. Teage, R.F.C., of a son.

Mr. Beach Thomas, of the "Daily Mail," writing apropos the capture of Monchy, says:—

"Meanwhile cavalry, who had formed up quite regardless of shrapnel and high explosive and even of attempts by the enemy's aeroplanes to dive at them and use machine-guns from the air, charged across the country on both sides of the village."

[Which would make it appear that the German aeroplanes were well up to the firing line and not fifteen or twenty miles behind, as the apologists for officialdom would have us believe.—Ed.]

"Our counter-battery work, or special bombardment of the enemy's gun positions, was magnificent, thanks to the eyes and courage of our airmen, who spotted the batteries and directed their fire."

[One is glad to see this tribute to the gun-spotters, whose work is far more worthy of praise than most people know.—Ed.]

The special correspondent of the "Morning Post," writing from the British Front on April 13th, says:—

Aeroplanes have performed some wonderful feats this week in keeping the German movements under observation. It has been impossible for the enemy to do anything with troops, guns, or transport in the new battle area without being seen by the watchful eyes of our aerial scouts. They have gone out repeatedly on the coldest days, flying for hours in snowstorms, spotting batteries, reporting concentrations of troops, and dropping bombs. On a day when few German aeroplanes dared to brave the gale they hovered about Hirondele Wood and plastered it with explosives. One intrepid aviator flew in the snow for two hours photographing and making frequent dashes earthwards close to the German lines through a patchwork of shrapnel, smoke and bursting shells.

You may judge of the efficiency of our aeroplanes from the fact that all the guns we have captured were previously located with unerring exactitude by them, and every battery abandoned by the enemy gunners was found just where the aviator said it was. Many go aloft and some never come back, but the work they have done will never be forgotten by the grateful armies they serve so well.

[One may commend to the "Morning Post" consideration of the point that one may "judge of the efficiency" of our aviators, but not of our machines, by the excellent work which they have done.—Ed.]

The special correspondent of the "Morning Post," writing from France on April 15th on the Battle of Arras, says:—

A curious little incident marked the final day of their occupation. Towards the evening of Friday a British aeroplane that had been circling above Lens and the mining hamlets behind it was seen to drop slowly into the German lines and settle in an open field. Watchers on the ridge thought it had been winged by German shrapnel and forced to alight. They waited for the observer and pilot to leave the machine before ordering our guns to shell it, and were puzzled to see the occupants of the aeroplane calmly walk round it, leisurely surveying their surroundings and stamping their numbed feet with no sign of perturbation. No German soldiers arrived to take them prisoners. Quite soon it was realised that they were alone. The enemy had slipped quietly away from that part of his line, and the aeroplane had voluntarily descended to complete the work it had begun aloft.

From the "Times" special correspondent, April 14th:—

Every day one is filled with admiration for the performances of our aviators, and yesterday I watched them sailing unperturbed over the whole of the Lens area. From another direction, however, I hear of one of the most gallant deeds of this war. A solitary aviator was returning from a distant trip when he was attacked by a large party of enemy machines. He fought till his ammunition was all exhausted, while making for home, himself and his machine being almost shot to bits. He had one eye literally shot out, a bullet in his body, and his foot smashed. His machine was riddled.

In spite of all, he made his report, in which he apologised for making a rather rough landing because his smashed foot impaired control. Then, duty done, he died. No honour, whether

the Victoria Cross or anything else, while it may recognise such a deed as this, can adequately measure it.

The correspondent of the "Matin" (Paris, April 16th), on the British front wrote of the work of the R.F.C. during the recent push as follows:—

The Flying Service was splendid, as usual. I may not, unfortunately, relate more than these few anecdotes:—

The pilot and observer of a squadron, a Captain and a Lieutenant respectively, pursued and twice dispersed two companies of Bavarian infantry, each 200 men strong.

An air patrol fought twelve successive engagements near Douai. On its return two aeroplanes missed their way and found themselves in the thick of it above the enemy's lines. One of them engaged, from a height of 200 ft., a squadron of Pomeranian Hussars, killed about twenty of them, and dispersed the remainder. The other aeroplane from the same altitude used its machine-gun upon a squad of 100 Germans, who were unloading trucks in a railway station, and exterminated the lot.

Finally, a deed of unheard-of prowess: Three aeroplanes flew along the main street of Lens on a level with the roofs and liberally bombed a regiment of Bavarian infantry, which was marching on the road of retreat.

FRANCE.

OFFICIAL COMMUNIQUÉS.

During the recent aerial fighting Sous Lt. Regnier brought down his fifth enemy machine and Adjutant Douchy his sixth.

APRIL 10th.—ARMY OF THE ORIENT.—British aviators bombarded the enemy camps at Pravista, in the Gulf of Orfano zone.

APRIL 11th.—ARMY OF THE ORIENT.—We compelled by our fire a squadron of 12 German aeroplanes to turn back in the Valley of the Vardar.

APRIL 12th.—ARMY OF THE ORIENT.—British aviators effectively bombarded the station of Porna.

APRIL 13th.—ARMY OF THE ORIENT.—British aeroplanes successfully attacked the aviation camp at Drama. Italian aviators repulsed an enemy squadron which attempted to bombard the Italian sector.

APRIL 14th.—ARMY OF THE ORIENT.—French aviators bombarded the revictualling centre of Bogdantsi, in the Valley of the Vardar.

APRIL 15th.—On April 12th and 13th our pilots in the course of numerous air encounters brought down 10 German aeroplanes, most of them in the district north and south of the Oise. Four other enemy machines were badly hit and had to land in a damaged condition in their own lines. On the 14th inst. 11 enemy aeroplanes were brought down, two by the fire of our special guns. A captive balloon was also brought down in flames.

Our bombarding squadrons carried out the following operations:—

On April 13th 4,160 kilogrammes (about 4 tons) of projectiles were dropped on the railway stations and establishments of the Briey basin (Woevre), and 1,200 kilogrammes (over a ton) on the railway stations in the Mézières-Sedan region. Most of the objectives were hit. Finally, during the night from the 13th-14th, the barracks at Dieuze (about half-way between Metz and Strassburg) and the railway station at Bétheniville (east of Reims) were effectively bombarded.

"L'Aerophile" states that the late Sous Lt. Henri Brégi was killed while starting upon an anti-submarine patrol. He is given a citation by the Ministry of Marine in French Army Orders of Feb. 10th. M. Brégi will be remembered as a famous pilot of Bréguet machines over land and sea. He was almost the first aviator to fly on active service, having flown at Fez during the trouble in Morocco about 1912. He flew in the various French Military trials, and in the competitions at Monaco, and visited England to test Bréguets at Shoreham and Colshot.

It was reported from Paris on April 13th that the aviator Navarre is "wanted" on a charge of attempting to kill two policemen. When police inspectors went to arrest him on April 12th at an aerodrome near Paris he was just getting into his machine, and as the inspectors approached Navarre flew away, presumably to the front.

In the opinion of Navarre's friends, the wound he received recently upset his mental stability, and as a result he was forbidden to fly higher than 3,000 yards. He has been in trouble several times lately, and, indeed, had only just come out of the Cherche Midi Prison.

This particular offence was that in the early hours of April 12th he tried to run down two policemen who were on point duty. Other policemen arrived, and one jumped into the car, but the aviator, a soldier, and two stray vagabonds whom Navarre had picked up attacked the policeman and forced him to let go.

At the Place de la Concorde Navarre tried to run down two other policemen at the corner of the Rue Royale. Navarre has been in trouble several times before. Insubordination,

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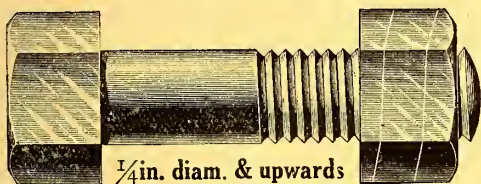


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striking an officer, selling his medals, and similar *jeux d'esprit* have been rumoured as causes of his various punishments. In the *Service d'Aviation* it is generally considered that he is an Apache who has gone mad.

GERMANY.

OFFICIAL COMMUNIQUÉS.

APRIL 12th.—In spite of the gale there was much aerial activity. In the course of the air fighting the enemy lost 23 machines, and one aeroplane by infantry fire.

Bombing attacks on enemy troop camps and ammunition dumps in the Vesle and Suippes valleys were observed to inflict damage.

Capt. Baron von Richthofen shot down his 40th enemy machine.

APRIL 13th.—During the night of April 10th-11th one of our battle squadrons dropped $3\frac{1}{2}$ tons of bombs on enemy barracks and an encampment near Fismes and Bazoches (about half-way between Soissons and Reims). Several hits and fires were observed. Reports from our advanced line referring to heavy and continuous explosions in the direction of Fismes confirm the results observed.

APRIL 14th.—On the entire front, but principally in the battle sectors, there was increased air activity. The enemy lost in air attacks on April 12th, 11, and yesterday 24 aeroplanes and four captive balloons. An enemy air squadron was destroyed near Douai. Baron von Richthofen's chasing squadron alone shot down 14 aeroplanes, of which Baron von Richthofen accounted for three and Lieut. Wolff four.

APRIL 15th.—In Artois, on the Aisne, in Champagne, and south of the Vosges there has been very lively aerial activity. The French, British, and Americans lost 17 machines in aerial engagements; four machines were shot down from the earth, and two captive balloons. Baron von Richthofen brought down his 44th opponent, and Lieut. Schafer his 18th and 19th.

From the three air squadrons which attacked Freiburg yesterday three British aviators were brought down.

[See Admiralty Casualty List published on April 16th.—Ed.]

APRIL 16th.—ARMY GROUP OF THE DUKE OF ALBRECHT.—A combined attack by enemy aviators on our captive balloons along the Aisne was unsuccessful.

Between Soissons and Verdun the enemy yesterday lost 11 aeroplanes, most of them of the latest construction.

It was reported from Amsterdam on April 11th that Lt. Frankl, one of Germany's best military aviators since the death of Bolcke, has been killed in action on the Western front. The Kaiser has conferred upon him the Order pour la Merite, Lt. Frankl thus being one of the few Jews with that decoration.

* * *

Ober Lt. Hans Berz, was killed on April 11th on the Western front in a fight with two Allied aviators.

* * *

It is reported that the Kaiser has asked the British military authorities to allow the body of his nephew, Prince Frederick Carl, the aviator who recently died of wounds received in an air fight on the West Front, to be sent to Germany for burial. It is understood that the request will be granted as a matter of courtesy to the gallant young officer who is dead.

RUSSIA.

OFFICIAL COMMUNIQUÉS.

APRIL 11th.—In the region of Galatz a French aviator hit a German aeroplane, which fell, enveloped in flames, upon Galatz.

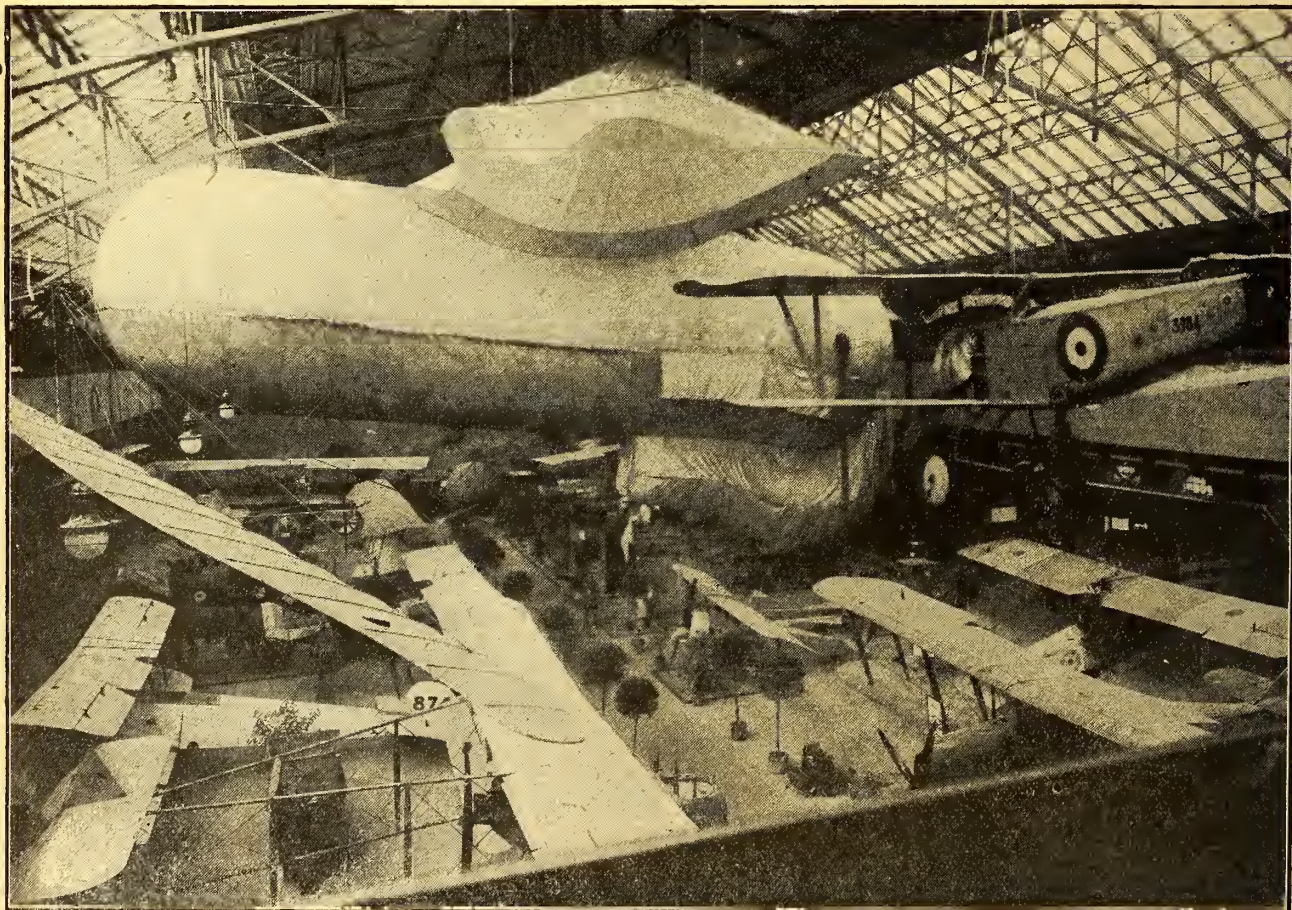
APRIL 13th.—In the region of the station of Pogoryeltsy, on the Alexandroff Railway, a German aeroplane was brought down. Our aviators carried out a flight over Gorokhoff (east of Sokal), and the adjoining railway line. Several scores of bombs were dropped.

A squadron of German aeroplanes, consisting of 16 machines, made an unsuccessful attack upon our rear in the region of Monasterzyska.

APRIL 14th.—In the region of Bohorodczany (Galicia) our aviators, Lieut. Makeinko, Ensign Guilcher, and Sec. Lieut. Yantchenko, brought down two German aeroplanes, which fell in the enemy's lines. The machine hit by Lieut. Makeinko was in flames. In Roumania, east of Focsani, the aviator Reveltisso brought down a German aeroplane.

APRIL 15th.—In the region of Boudslav railway station, north-east of Vileika, Pilot-Lieut. Waksowski brought down a German aeroplane. The machine caught fire, and its occupants perished. East of Bozejany Pilot-Lieut. Kokorinoff brought down a German aeroplane, which fell in our lines.

APRIL 16th.—WESTERN FRONT.—On the rest of the front aerial activity and reciprocal firing have taken place.



AROUSING ENTHUSIASM.—A photograph circulated in a new Trophies. One perceives an F.E. and an R.E., a Nieuport and is an Avro, apparently 874, which, if one mistakes not, was the R.N. to Friederichshafen. An F.B.A. flying-boat may be seen as a method of educating those concerned with aviation in this country. modern German aeroplanes hidden, apparently for fear lest any

neutral country of a German Exhibition of Aeronautical War a Morane. Also a kite-balloon and a parachute. On the left the machine flown by Squadron Commander Featherstone Briggs, seen in the background. One commends to the Air Board this try, as it seems an improvement on our method of keeping one outside official designers might learn something from them.

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Pilot Sub-Lieut. Pachenko hit a German aeroplane, which caught fire and fell into the enemy's lines.

ITALY.

OFFICIAL COMMUNIQUÉS.

APRIL 13th.—This morning, at dawn, enemy aircraft dropped bombs on the pumping station at Codigoro (on the Po di Volano, 25 miles east of Ferrara) without doing any damage.

APRIL 14th.—Aerial reconnaissances carried out by both opponents led to several air fights; two hostile aeroplanes were brought down, one of our machines is missing. One of our air squadrons succeeded in dropping bombs on the railway stations of Prvacina and Vucia Draga (Gorizia-Trieste Railway), in the Frigido (Vippacco) Valley. Our aviators, flying low, came under heavy artillery and machine-gun fire, but all returned safely to their bases.

* * *

It is announced that King Victor Emmanuel arrived at Tarente from the front a few days ago by aeroplane, this being His Majesty's first aeroplane flight.

* * *

There are grave reasons for believing that the Austro-Germans are using dum-dum bullets in the guns mounted on their fighting 'planes. A medical report states that a well-known pilot's wound was caused by an exploding projectile. So far, frightfulness between combatants had not appeared on this aerial front.

* * *

The F.I.A.T. firm has devoted a lump sum of half a million lire to a war charity in need of 'such, viz., The Soldiers' Orphans Fund.

* * *

The Pomilio biplane, of which you have heard a lot recently, besides being fitted with the engines of the beneficent and above-mentioned company, has a peculiar metal entering-edge, as well as, of course, its all-metal "bone work."

* * *

G.H.Q. publishes the following on the aero activity along the lines, under Italian Command for the four months ending March 25th:—

"Notable episodes in our aerial operations were the bombardments of the enemy camps at Dorimberg and Comeno on Dec. 20th, 1916; that of the railway-sheds and hutments in Rifemberg, St. Daniele and Cobdil on Jan. 8th, 1917; that of the hydro-aeroplane station in Trieste Harbour, and of the Prosecco aerodrome on Jan. 12th, 1917, and that of the docks at St. Rocco, near Muggia, and the railway station of Opicina on Jan. 11th, 1917.

"Bombings effected by our airships were:—The enemy camps near Comeno on the night of Feb. 21st, 1917; the Prosecco aerodrome on Feb. 23rd, 1917; the railway at Rifemberg on Feb. 26th, and the Calliano station on Feb. 18th, the last three raids being also night ones.

"Attempts at hostile invasions by air were not wanting; those over Aquileia, Monastero and Cape Farello, the night of Jan. 12th, 1917; over Villa, Vicentina and Cervignano on Feb. 12th, and Gorizia on March 13th, 1917, did us a certain amount of damage.

"In numerous fights, and by our A.A. gunnery, 12 enemy machines were brought down. We lost four.

"In a raid at Valona, two hostile seaplanes were accounted for. We lost one."—T. S. H.

BELGIUM.

OFFICIAL COMMUNIQUÉ.

APRIL 15th.—Belgian aeroplanes bombarded with success the hutments of Houthulst and the stations of Vyfwegen, Zarren and Staden.

AUSTRALIA.

From the "Daily Telegraph," Sidney, New South Wales:—Although the construction of the aerodrome at the N.S.W. Aviation School at Richmond was only begun in March last year, the work was pushed on so expeditiously that 24 students began training in the following August. Of these, 19 qualified as pilots before the end of the year, and are now well on their way to England. The second course for students is at present in progress.

Mr. A. E. Cutler, executive member of the Committee of Control, in mentioning these facts in a report to the Premier and the Minister for Education, says that the functions of the Committee of Control are now only concerned in the selection of students for the various courses. It would, therefore, appear that, to a large extent, the functions for which the committee was originally called together do not now exist.

In the inaugural period of the undertaking, proceeds, Mr. Cutler, two dual-control aeroplanes were purchased. Subsequently a small second-hand Caudron machine was bought, but the whole of the flying in connection with the training of pupils was carried out by the two Curtiss machines. Upwards of 600 flights were made, an astounding result for two machines, without such machines being subject to reconstruction. These results were the more gratifying in view of the severe criticism

levelled against the school for having purchased such "unsuitable machines as the Curtiss."

How much longer the present machines were going to hold out was another matter, and the working of the Aviation School with only these two machines, was to a large extent courting disaster.

Seeing the almost complete impossibility of obtaining machines from the Old Country, Mr. Stutt and his mechanics undertook to build four improved Caudron machines in the belief that certain engines could be procured from England. It was found finally that they could not be provided, so as a last resource the manufacture of the engines was begun at the Government workshops at Walsh Island. The moulders' strike had delayed the work, but every endeavour was now being made to complete one of these engines. As one of the 'planes was nearing completion a Gnome engine was purchased, and it was anticipated that the first Caudron would be ready for tuition purposes within the next few days.

The two Curtiss machines and the new Caudron were still insufficient to guarantee efficient training of pupils, the chief instructor claiming that there should be at least half-a-dozen machines.

Pilot-instructor Stutt considered the Morris-Farman (*sic*) machine the best for training purposes, and it was considered, now that the success of the first course had been made known to the Imperial authorities, more help would be given in the direction of obtaining additional machines. If the Morris-Farman machines are still not procurable, Mr. Cutler recommends that two additional Curtiss machines should be obtained at once.

Mr. James, the Minister for Education, states that he is entirely in agreement with Mr. Cutler's recommendation as to the future management of the school, and suggests that it be placed under the control of the Technical Education Branch. He also urges that if the finances permit, the two new aeroplanes recommended by Mr. Cutler be purchased.

INDIA.

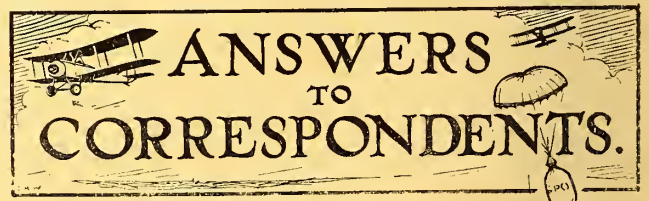
A Bombay telegram states that Sir Dorabji Tata has placed a lakh and a half of rupees at the disposal of the Government for the purpose of providing a squadron of seaplanes for the defence of Bombay and the sea coast.

THE BEATTY MOVE.

It should be noted that as from Monday, April 16th, the offices of the Beatty Flying School were moved from the Hendon Aerodrome to Cricklewood, Broadway, N.W.2. This move has been occasioned by the annexation of the London Aerodrome by the Military Authorities.

Mr. Beatty has acquired a large and well suited tract of land as an Aerodrome, which is situated behind the Midland Railway station at Hendon, and occupies 200 acres. The business of the School will be continued without interruption, and all correspondence should be addressed to the Beatty School of Flying, Ltd., Cricklewood Broadway, N.W.2.

The excellent work done by Mr. Beatty in training Naval and Military pilots, and the efficiency of his small biplane and the Beatty engine, stamp him as no ordinary man. In fact, so far as aviation is concerned he may safely be considered as the first, and in many ways the foremost, of our American Allies. One wishes him and his School every success in their new habitation.



On account of the labour involved in replying to questions from correspondents, many of which in the past have been answered over and over again by post, it has been decided to answer inquiries of general interest in the columns of THE AEROPLANE. Inquiries should be addressed to The Editor, 166, Piccadilly, W.

READERS BY THE HUNDRED.—If you want any information about joining the R.F.C., write to the Director of Military Aeronautics, Adastral House, Blackfriars, E.C.

If you want any information about joining the R.N.A.S., write to the Air Department, The Admiralty, Whitehall, S.W.

F. J. C.—(1). The trouble about armouring aeroplanes is that to be effective the armour is likely to be so heavy that it is impossible to make the machines climb. The Germans tried an armoured aeroplane for photographic purposes with some success something like 18 months ago, and for very special work of this kind it seems quite worth while to build special aeroplanes.

(2). As regards nose diving, most nose dives are caused by the machine stalling near the ground owing to the carelessness

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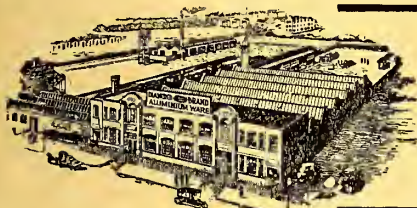
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of the pilot, and not having time to regain its normal position before hitting. The height in which a machine can be made to regain its position varies immensely according to the type of machine, and apparently inherently stable machines are more dangerous in this respect than others, because the big tail, necessary to ensure inherent stability, prevents the elevator from working at low speeds. It is a very debatable point whether, for war purposes, especially for fighting machines, inherent stability is at all advisable. Apparently the Germans think not, because none of their fighting machines are stable, though they are extraordinarily controllable. I have never yet heard of the speed of a descent being so great that the pilot has been unable to pull the elevator back to the necessary extent, but, on the contrary, in the cases of inherently stable machines which have been forced into a dive by the pilot, it is necessary for the pilot to release the forward pressure on the control rudder very gradually, otherwise the machine in its effort to resume its normal position will either loop the loop or break itself in flattening out. This was known by all experimenters with models long before anyone looped the loop actually, because it was found that if one launched an inherently stable model at too great a speed it proceeded to loop the loop.

(3). Large fin area aft naturally makes a machine slower in answering its rudder, and it is still debatable whether in fighting machines a large properly balanced rudder is not better than a large fin. Apparently the Germans think it is, though one notices that in the recent Albatros they used a comparatively big fin as well. This is probably necessary owing to the enormous area of the engine and its housing.

(4). Certainly balanced rudders are superior to unbalanced rudders, but apparently there is still much to be learnt about the art of balancing.

(5). Undoubtedly a round entry for a nose of a machine is the most economical, as it approximates closest to a proper streamline. The extra lift that can be obtained by having a flat underside to a fuselage is not worth considering, and if carried to an extreme, might upset the longitudinal control of a machine to some extent unless very scientifically done and counter-balanced by corresponding flat surface above.

S. L. (Surrey).—If you have an idea for improvement in aeroplanes, your best plan would be to submit it to the Technical Department of the Air Board, Air Board Offices, Strand, W.C.2. Of course, it may take some time to consider the invention, but at any rate if it is adopted you will be treated fairly, even if the idea is not patented.

H. O. Brooker.—Unfortunately, there is no existing book on aeroplane rigging. Your best course would be to look up literature dealing with yacht and boat rigging. It is sincerely to be hoped that this important subject will be dealt with by some competent person. Capt. Barber's book, "The Aeroplane Speaks" (Price 7s., post free, The Wm. Dawson Publishing Co., Ltd., 2, Breams Buildings, E.C.), deals with the subject in a general way, and should be studied by all who wish to comprehend the handling of aeroplanes either in the air or on the ground, but it does not extend to details.

A. G. F. (Tooting).—There is no book devoted to the subject of wire splicing for aeroplanes. The principles involved are very similar to those of wire splicing in ship rigging, and I should recommend you to get in touch with the Editor of "Motor Ship and Motor Boat," at 7, Rosebery Avenue, E.C.1, and ask him whether he can recommend a book.

THE BIRMINGHAM AERODROME.

Mr. Bettinson, late of the Royal Naval Air Service, who has recently taken over the Birmingham Aerodrome at King's Heath for a Flying School, wishes it to be stated that all correspondence should, for the present, be sent to him at "Hall Green, Birmingham."

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Any manufacturer requiring a Midland representative to act as either buying or selling agent would do well to get in touch with Mr. Bettinson at the earliest opportunity.

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The Editor of THE AEROPLANE would be glad to hear from any reader possessing an intimate knowledge of the technical terms used in French, German, and Italian for various parts of aeroplanes and motors who would undertake the translation into those languages of a list of some hundreds of technical words used in connection with aeroplanes and aero motors. Terms of payment to be arranged.

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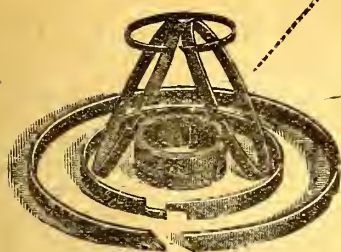
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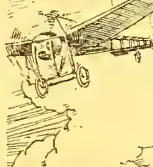
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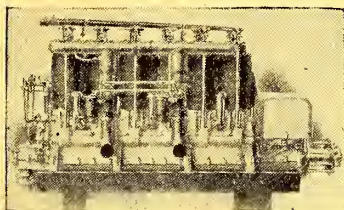
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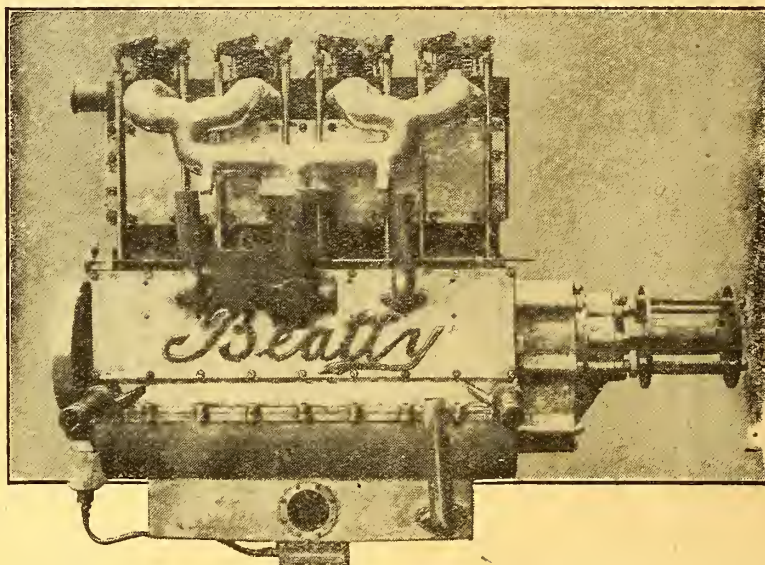
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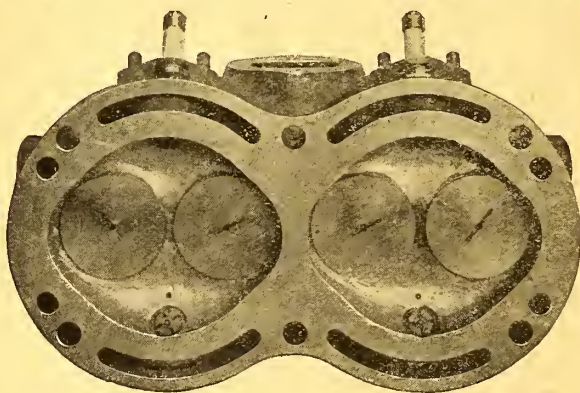


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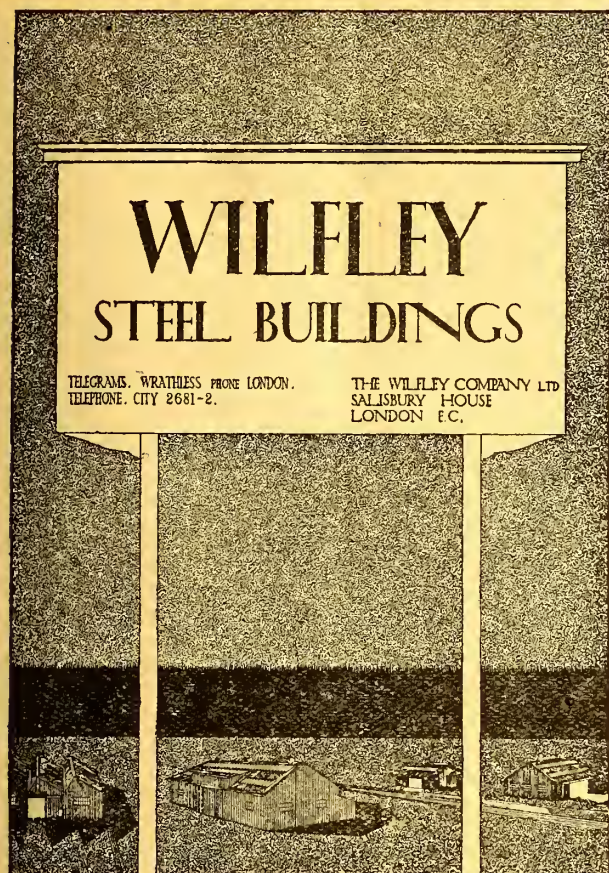
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ON THE DISCOVERY OF AMERICA.

There is a somewhat ancient story concerning a group of people who were arguing as to who was the greatest man in the history of the world. A free-born American citizen among them guessed emphatically that the greatest man the world had produced was Christopher Columbus, because he discovered America. On which a quiet Englishman in a corner remarked, "Bosh! America had been discovered by half a dozen people before Columbus, but they always had the decency to keep it dark."

Somehow, I fancy, this war is going to help us to re-discover America. Very few people in Europe know America as she really is, and the Americans who came to Europe before the war did not, as a rule, assist our knowledge or incite any desire to know more of America. To the average Englishman, and probably to most other Europeans, America was the land of the gold brick and of the wooden nutmeg; of the Yellow Press and of the blatant commercial traveller; of scare headlines and of flat-catching advertisements; of many dud motor-cars and of a few quaint but serviceable automobiles; of the vulgar music-hall artiste; of the still more vulgar millionaire and of the super-vulgar millionairess; of the rubber-neck tourist and of the gentle grafter.

All of which was fairly balanced by the American estimate of Europeans based on bogus Continental counts, penniless British peers, Irish and Italian emigrants, English remittance-men, and sundry others of the froth and dregs of European society. Neither of us saw much of the sound and solid body of the other's population, because the best people stayed at home in decent prosperity, or when they crossed the Atlantic conformed to the manners and customs of the country which they visited. So far, at any rate, we can cry quits.

Some of us had come across the real American and respected him. In some modern British workshops we know the quiet, neat, and extraordinarily capable American mechanic who came over years ago to install and show us how to work American machine-tools. In some factories we knew the keen, clever, and equally quiet-living organiser or works-manager who evolved order out of chaos and turned our old-fashioned mess and muddle into a smooth-running machine. In some newspaper offices we knew the able and cool engineer who took charge, always quietly and without fuss, of the mechanical side of the business and planned out the running of the printing plant, the system of motor delivery of the finished papers, and everything else, so that the whole thing ran like a clock instead of in a continually wasteful state of flurry and stampede. And some of us knew the American soldier and sailor of the regular services attached to Embassies, and found that they took their professions seriously, as being worthy of an intelligent man's life work.

In aviation we knew quiet, determined men like the Wright Brothers, and Glenn Curtiss, and George Beatty, and Clifford Prodder, who flew much and talked little, but who, when they did talk, talked horse sense with a humorous twist and a gift of illuminating hyperbole which distinguished them from the ordinary run of Englishmen, though the slight drawl and flattening of the vowels in their speech might just as well have come from Plymouth, Devonshire, as from Plymouth, U.S.A., and is not in the least like the blatant Yankee accent to which we have been subjected by the obnoxious Americans more commonly known to the bulk of the English people.

THE WAR-AMERICAN.

Since the war, the real American has probably become better known. The traffic between America and Europe in war-time has not been propitious for the Yankee hustler, or the drummer with the gold teeth, or the tourist who "does" three counties a day.

Instead of them we have had the hard-headed business man who has come over to organise deliveries of war material, the man who does his work methodically and efficiently, and does as much in a day as the old-fashioned Englishman used to do in a week. We have had the American volunteer ambulance worker and relief distributor, keen and self-sacrificing and hard-working. Sometimes, as in the case of an earnest and capable U.S. artillery officer, with whom I have had the honour of forming a friendship which I hope may endure long after the war, the keen ambulance worker was also a soldier studying the organisation of a modern war while driving night and day, in all weathers, over mountains and broken roads where one would scarcely have imagined a car could go. Also, we have had the American soldier and aviator, a volunteer in the army of one of the Allies, dead in earnest, moving heaven and earth to get to the job of killing Germans.

And the curious thing to the Englishman about these war-Americans is that they are so quiet about it all. They attain speed without hustle, and they get things done without shouting about it. Which is only what was expected by those of us who knew the real American before the war.

All that has been done by Americans to help in the war has been less advertised than have the imitation hospital nurseries of half a dozen of those curious women who ought by birth to belong to the old nobility of England, but who have somehow gone slightly off colour and have become afflicted with limelight disease, and whose chief aim in life appears to be to appear in an illustrated paper clothed in a fancy nurse's costume and a picture-postcard smile.

WAR KNOWLEDGE.

America comes into the war with an initial advantage over any other Power, for America's representatives

have seen the war from both sides, and know both the strength and the weakness of German, French, and British methods. Germany, in the early days of the war, and until quite recently, did her best to impress American journalists with the excellence of her organisation. They were taken as near the firing line as it was safe for them to go, and some of them were even taken for trips over the firing line in German aeroplanes. Which means that, if they are no more intelligent than even English journalists, they must have picked up quite a useful idea of what is good and what is bad in the German system.

Moreover, it is fairly safe to assume that the American military and naval attachés at Berlin know most of what there is to know about German organisation, or, at any rate, all that really matters, for the great secrets and the hush-hush *ruses-de-guerre* which are so religiously prepared by all nations are chiefly surprises only in that they interfere so little with the seemingly conduct of the genuine science of war. The basic principles of war remain the same, whether conducted in the air, on or under the ground, or on or under the sea, and America's soldiers and sailors have had unrivalled opportunities of learning the latest developments of their science up to the moment of entering the war.

NAVAL AVIATION.

Certainly where naval aviation is concerned, America's knowledge should not be behind that of any country in the world. The U.S. Navy has the advantage of having had in this country one of the ablest naval aviators in any Service, and as the R.N.A.S.—whatever criticisms it may have deserved from time to time—has certainly had more experience of sea flying than any other naval air service in existence, it is reasonable to suppose that all its dearly bought experience is at the disposal of our new ally, who is well able to put that experience to good account.

Moreover, it is common knowledge that the big flying boat, which is without doubt the most effective aerial weapon for many special duties, is not only of Anglo-American origin, but has been developed more or less successfully to great sizes and powers in America.

The American engineer is quick to learn, and has no false pride to hinder him in scrapping what is proved to be bad and in replacing it by what is good, so that it should not take long for American seaplanes to be produced which are up to the British standard of strength and workmanship, and can be produced on the American scale as concerns quantities and speed of manufacture.

MILITARY AVIATION.

Where military aviation is concerned, America has certainly more to learn; for though the Wright Brothers and Mr. Curtiss and Mr. McCurdy flew long before anybody in this country, the U.S. Army has taken little interest in aviation. So far as one can gather, the little detachment of aviators employed in the recent affair in Mexico met with very limited success—in fact, one would judge that a squadron of the old original R.F.C., equipped as it was when it went abroad in August of 1914, could have done at least as much.

Also, military aviation in all European countries is so far in advance of naval aviation—that is to say, the use of aeroplanes at sea, pure and simple, apart from the skill of those who fly them—that the gap between the U.S. Army's aeroplane force and the military aviation service of any first-class European Power is much greater than that between the U.S. Navy's aeroplane force and that of European countries, in experience as well as in size. It has been constantly pointed out in

American aviation papers that the U.S. Army has neglected aviation even worse than it was neglected by the British Army before the war.

That energetic paper, "Aerial Age Weekly," which has fought as strenuously for an effective military aviation service in the States as this paper has fought in this country, has endeavoured to waken the U.S. Army authorities to a proper sense of their responsibilities. It has carried on a propagandist campaign, with the assistance to some extent of the Aero Club of America, but chiefly on its own account, all over the United States. It has tried reasoning, and the force of example, and ridicule, and most other methods of persuasion. And it has undoubtedly had considerable effect, albeit not as much as its earnestness deserved. But such is the fate of all advocates of reform or of progress when the reform or progress does not promise immediate pecuniary profit to someone or other who has sufficient influence to force it along.

We of the staff of THE AEROPLANE can sympathise with our trans-Atlantic *confrères*. And, like them, we are enabled by the coming of war to indulge in the luxury of saying, "I told you so." Which is always a gratifying, if unsubstantial, reward to a minor prophet.

THE CAUSE OF TROUBLE.

A somewhat cursory study of the history of U.S. military aviation during the past three or four years leads one to believe that the cause of the weakness is due to something rather like the initial troubles of the R.F.C.

In this country the beginnings of military flying were in the hands of the Royal Engineers. The pre-war Sapper was not the gore-stained warrior of to-day by any means. He was generally an estimable gentleman of considerable scientific attainments where engineering was concerned, very much out of touch with the science of war. The aeroplane amused him, and sometimes interested him, as a piece of machinery, but as a rule he was not enough of a soldier to appreciate its place as a weapon of war. Constantly the development of Army flying was seriously cramped till it came into the hands of artillerymen and officers of the line, who cared less about aeroplanes as mechanical problems, and thought more about their possibilities as adjuncts to the work of their own particular arms, guns, cavalry, or infantry as the case might be. And to-day, when the R.F.C. is the best-trained and best-organised and best-manned force of its kind in the world, the Corps of Royal Engineers is the one solitary combatant branch of the Army which makes no direct use whatever of aeroplanes. Certainly aeroplane photographs enable it to make maps for the rest of the Army, and to dig its mines in the right places, but it has no cause for direct contact with aeroplanes in action, as have the other arms. Which justifies all the rude things which I wrote six years or so ago about our wrong-headed policy at the beginning.

ACADEMIC WEAKNESS.

In a somewhat similar way, U.S. Army aviation has been placed in the hands of the Signal Corps since its beginning. Just what the Signal Corps does for a living I have been unable to discover, but I gather that its job is something like that of our Signal Service, R.E. Anyhow, why the U.S. Signal Corps should have anything to do with artillery observation, strategic and tactical reconnaissance, infantry contact patrols, and aerial fighting, does not appear obvious. Moreover, I gather from American friends that the Signal Corps is composed largely of officers of academic distinction, who are precisely the wrong kind of human being to organise and train what is essentially a fighting force.



AMERICAN AIRCRAFT

GEORGE VANDERBILT

A further difficulty is said to have arisen last year, because when in some strange fit of generosity the High Authorities wanted to allot a fairly large sum of money to military aviation it was discovered that the amount was larger than that allotted for all the rest of the work of the Signal Corps, with the strange result that the part (about to be) appeared likely to be bigger than the whole (as it was)—which, as Euclid has frequently observed, is absurd. Q.E.D. Therefore the academic gentlemen of the Signal Corps, rather than offend the shade of the late Euclid, decided that the aviation section (projected) should be reduced in size, in conformity with geometric convention. And so it was.

THE QUESTION OF PERSONNEL.

The U.S. Army will find, as we have found, that the less academic a man may be the better his chance of being a useful flying officer. In the R.F.C. some magnificent work has been done by Sapper officers, such as the late Colonel Lewis, R.E., and the late Major James, R.E., but I am inclined to think that if one could draw up a balance-sheet of the effects of sapperdom on flying the balance would come out on the wrong side. The gunner officer is by nature and training best fitted to control the technical side of military aviation, for his scientific training is subordinate to his mechanical training, and he is all of a soldier as well. The cavalryman, provided he is a real horseman, makes by nature and training a splendid pilot. And the infantryman, if less dashing as a pilot, is more fitted for the steady routine work of aerial patrols.

America has splendid opportunities for manning her Flying Corps if she goes the right way to work.

The American motor mechanic, who exists in tens of thousands all over the States, is practically a ready-made air mechanic. The ordinary fast-driving automobilist, who is fined regularly for "speeding"—as they call it in America—would thoroughly enjoy flying. And, personally, if I wanted to man a whole fleet of high-speed bomb-droppers with their attendant escort of fighting machines, I should go straight out to the cattle country and rope in all the broncho-busters and cow-punchers who were game to take a hand in the great game. There one has exactly the class of man for that class of work, though he might be bored if one put him on to dull routine duty, such as flying up and down over a row of anti-aircraft guns spotting for a battery.

So if America wants the best kind of flying corps she should hand the job of making it to her artillery officers and let it go at that.

THE QUESTION OF AEROPLANES.

The matter of aeroplanes is really America's worst trouble. The American aviation papers published at the time of the "Pan-American Aeronautical Exposition"—otherwise the New York Aero Show—make it pretty clear that the U.S. Aircraft Industry has still to produce its first war machine.

The country is full of excellent school machines. The "comic Curtisses," as our young officers irreverently style the standard products of the Curtiss Motor and Aeroplane Corporation, have done most useful work in training our pilots, and they are probably unbeaten by anything so far produced in America. But they are not within ten miles an hour of being usable on active service.

So far, the Curtiss "wireless" scout and the same firm's triplane seem to be the nearest approach to an American war machine, though one does not as yet know the precise performance of the Wright-Martin biplane with the American-built Hispano-Suiza engine. Anyhow, none of the American machines come up to

the war requirements of to-day in performance, even if they are adequately strong, which seems doubtful in many cases.

It will be well to remember that in these days a two-seater reconnaissance machine, carrying two men, two or three machine-guns, a camera, ammunition, food, and fuel for at least $3\frac{1}{2}$ hours, has to do at least 100 miles an hour, has to climb 10,000 feet in not more than 15 minutes, and has to get up to over 15,000 feet with full load. And a single-seater fighting machine, with pilot, machine-gun, and ammunition, has to do as near 130 miles an hour as no matter when at a height of 12,000 feet, has to reach 10,000 feet in 10 minutes or less, and has to get up to 25,000 feet if pushed. Which is about what the German machines of such types do.

If any American aeroplanes can touch these figures, they are doing better than any American machine so far recorded in this country.

LEARNING FROM EUROPE.

If American aeroplanes and engines can put up such performances or better, well and good; but, if not, she had better come and learn in Europe how to do it. Already certain wide-awake firms have come to a working agreement as regards engines. The Sunbeam Co., of Wolverhampton, are, one gathers from the American papers, working in alliance with the Sterling Motor Co., of Buffalo, and the Hispano-Suiza Co., of Barcelona, are working in alliance with the Simplex Motor Co., of New Brunswick, New Jersey, which is the engine branch of the Wright-Martin merger. This is a good beginning.

One would like to see similar arrangements between aeroplane firms. Machines with performances such as are put up by the Sopwiths, de Havillands, Bristols, Vickers, Martinsydes, Spads, and Nieuports are unknown in America, so far as published information tells one, and doubtless enterprising business men in America would gladly pay for the knowledge acquired in two and a half years of actual war service by the designers of those and other machines.

Everyone would profit thereby. The British designer would draw royalties; the American firm would give greater satisfaction to the U.S. Flying Corps. Both firms would enhance their international reputations, to their ultimate benefit after the war. The U.S. Flying Corps would do greater execution on the Hun, and so would help to end the war. Which would doubtless please the German people quite as much as anyone else. And so the world in general would be benefited by such a working agreement.

PRACTICE VERSUS THEORY.

Those who have the say-so in equipping of America's aviators will do well to consider these points, for doubtless America, like other countries, suffers from a superfluity of scientists, who are always going to do wonderful things and always manage to achieve results which are just twelve months behind those of the common rule-of-thumb factory producer. I feel pretty sure that America's scientists will assure America's workshop bosses that, if they are given six months more in which to carry on experiments in wind-tunnels and to fiddle with slide-rules, they will have Europe's star-turn aeroplanes beaten to a frazzle.

And at the end of the six months they will probably produce something with a performance about equal to that of the contemporary British official design, which, if put in the air at the same time as a six-month-old product of Kingston, Eng., or Hammondsport, N.Y., or Oshkosh, Wis., would never see the way it went, for the smoke in its slipstream. *Time Danaos et dona ferentes* was, and is, a good old motto, but a better one

. The .

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is "Mistrust the scientist with slide-stick promises." Trust the man with the hammer and chisel and pliers and spanner; he will probably produce an aeroplane with a performance somehow. But beware the high-brow with the table of logarithms and the calculating machinery. His aeroplanes generally stop on paper or very near the ground.

SOME SIMPLE MAXIMS.

After all these months of war, we in Europe think we know something about the greatest game of all, and here are a few simple maxims representing something of what we have learnt, anyhow where aviation is concerned:

Don't mix your military and naval services. A soldier is a soldier and a sailor is a sailor, and no man can serve two masters. Mixed services are worse than mixed drinks.

Scrap ruthlessly. Get rid of "duds," whether aeroplanes, engines, or administrators, especially the last. A good organiser will rub along somehow if a bad administrator inflicts bad aeroplanes and engines on him, but he will do better if a good administrator gives him good material with which to work. Therefore be quicker about scrapping men than about scrapping machines. Dud aeroplanes are useful for school work. Bad officials are no use for anything.

Insist on performance. Never mind what the scientists calculate. Trust the man who guesses, and guesses right. If his machine gets higher than the scientists, and flies faster, it is a better aeroplane for making war.

Remember that the top dog is the top dog. If your aeroplane can go a thousand feet above your best enemy and stop there, you have got the drop on him all the time. And see that it gets there quickly. There is no use in burning half your gasoline in reaching a height at which it is safe to cross the firing line. Better make a lighter aeroplane and carry less "gas" at the start.

Trust the man who has been there. The active-service pilot who has flown over the enemy's guns and who

has fought the enemy's chasers, knows more about what is a war aeroplane and what is not than all the academic soldiers and sailors and all the university professors put together. He has bought and paid for his knowledge, and it is his very own property. The other fellows are generally paid for pretending to know what they mostly don't, and they spend so much time telling the people who pay them what a lot they know that they haven't time to learn from the man who has been there.

There are lots more little things like those, which we have learned in Europe since war began, only there is no more room for them here. Probably those gallant lads of the *Escadrille Americaine* in the French *Service d'Aviation Militaire* could add their share also, and so could some of our American Canadians, or Canadian Americans—you can never tell which is which—for all that the former are fighting pilots pure and simple, and have not had the labour of studying the intricate science of war, as is necessary for the reconnaissance officer and the gun-spotter.

One learns from the papers—so it is probably wrong—that America's aviators at the front are to stop there because they are doing such valuable work. No one disputes the value of their work, but I cannot help thinking that the more serious-minded of them would be still more valuable at home, telling the U.S. Army authorities what is really needed on active service, and—something which is even more important—what should be avoided. Besides which they would be of great use in teaching the new pilots what to expect in war, and how to avoid being hurt while at the same time hurting the Hun as much as possible.

Anyhow, we are going to see something mighty interesting when the U.S. Flying Corps comes into the war, and when the whole U.S. Army and Navy get properly to work I rather think that the world at large and Germany in particular is going to discover America. —C. G. G.

THE AMERICAN AIR SERVICES.

BY "BERKELEY."

Since that decade in the eighteenth century when the British forces in the American Colonies fell before a people who neither understood nor practised the manner of war laid down by the politer races of Europe, the military economy of the United States has been of high interest to those whose lives are spent in warlike studies. In Europe, organisation and training have for three centuries been of the first importance; in America neither has been popular. A supreme self-confidence has delayed the necessary preparation for war until the eve of hostilities. The evil consequent on this policy has been less powerful, owing to the equal lack of preparation on the part of such neighbours of the United States as were at any time likely to resort to force. The ocean barrier was a sufficient protection against a bellicose European Power.

The profession of arms had little attraction for citizens of a race whose attributes were mainly commercial. Monetary gain had greater material satisfaction than military honour. Again, in the absence of wars, the military life is slow in progression, and the rewards scanty.

Until the Spanish-American War, the regular army of the United States had a peace and war establishment of rather less than 30,000 of all ranks. No General Staff existed, and no organisation higher than the regiment had been drawn out, either in practice or on paper. The lessons of that campaign brought the strength of the regular army up to 100,000, and caused the formation of a General Staff and a War College. A great advance

in the study of military science at once followed, and it is not too much to say that there are young American regular officers whose theoretical knowledge of the art of war bears favourable comparison with that of the trained European soldier.

This hesitancy in preparation for war is not altogether without advantage at such a time as the present. The assistance of the United States in personnel is not of high urgency, and consequently a period can be allowed for the necessary intensive training of any Expeditionary Force that may be sent to fight under the vision of the common ancestors whose mortal remains rest beneath the historic fields of Flanders. Under these conditions it is possible to organise on the lines which the war experience of the past three years has decided to be most appropriate in the struggle for victory.

The United States regular army, unbroken by swift and necessary war, may be expanded in such manner as will permit the trained personnel to leaven the drafts of conscripted or enlisted recruits. The preliminary training will be hastened, and the stage at which the newer science can be taught will be brought nearer.

The greatest advantage of the present unpreparedness will come from the newest of all arms—the flying service. Untrammelled by precedent, the organisation best suited to the conditions of the time and supported by experience in the wars of Europe can be adopted and perfected without the delaying necessity of preliminary trial and error. American aviators whose thirst for adventure, unsatisfied in the canning factories and wheat

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pits of Chicago, has led them to seek battle over the plains of France, can assist with their practical knowledge of the minor worries of the flying personnel.

In a recent issue of the "Field Artillery Journal" (U.S.A.) there appeared a study on Military Aviation prepared in the War College Division General Staff on a recent but undated occasion. In it are summarised conclusions drawn from the history of military aviation during the present war, together with a consideration of the methods adopted or to be adopted for the aerial defence of the United States in America. It has become habitual, as is indeed common in all democratically governed countries, for the American to regard defence as a matter of first importance without realising the value of a prepared offensive as the surest protection of a country threatened by attack from outside.

These conclusions do not differ greatly from the principles propounded in these pages at any time during the last five years. Military science is exact in nature, and, if its principles are understood, the outlines of a reply to defensive or offensive problems can be given with a fair degree of certainty.

The allocation of duties between the Army and the Navy does not differ materially from that in practice in Great Britain. The harbour defences and all similar land positions are in the hands of the Army, while the seaward patrol of the coast is undertaken by the Navy.

DUTIES ALLOCATED.

The work to be carried out by aeroplanes attached to harbour defences is classified as follows:—

- (a) Reconnaissance.
- (b) The prevention of enemy aerial reconnaissance.
- (c) Offensive action against enemy aircraft, submarines and other vessels, and in the prevention of mining and countermining.
- (d) Spotting for coast artillery.

Paragraphs (b) and (c) would appear to be part of the same category of duty. The classification is such as would be laid down by any country under similar conditions. Among the detail of duties given under paragraph (d) it is specified that aeroplanes shall spot for the shore batteries against enemy ships. It would be interesting to hear in what manner the Americans propose to carry out what has been up to the present an impossible duty. A ship is a moving target operating in an element of vast similarity, in which no wave preserves its individuality for a sufficient space of time to make recognition possible. There are no aiming marks on the sea, and a squared sea map would lack all use. Range might in some degree be indicated from above, but line would ever remain mysterious if help were to be expected from the air. It is not understood in what degree aeroplane spotting is required against targets which are invariably in the full sight of the guns and at a height which is constant.

In addition to the harbour defences, the United States Army maintains a number of mobile units for the protection of the coast on the great reaches away from fixed defences. The paragraph dealing with the employment of aeroplanes in this matter may be quoted in full:—

"The use of aircraft with the mobile units is a definite matter; each division requires one squadron of twelve aeroplanes. These are divided into three companies of four aeroplanes each; two companies having reconnaissance and artillery observation machines; and one company having two high-speed machines especially constructed for long-distance reconnaissance and for combating the enemy's aerial craft, and two battle machines for the purpose of bomb-dropping and offensive work against enemy material of all sorts. This is in keeping with the best practice that has been developed in the European War." Which is open to debate.

No reserve aircraft are mentioned, nor is reference made to the establishment (personnel) required. The squadron in regard to first-line machines is similar to those of the British Army in pre-war days and possibly of to-day. It is impossible for any to express an opinion as to whether one squadron of aeroplanes for each division is an adequate provision unless the extent of the divisional area is specified. In countries such as the United States of America, where the possible supply of aircraft could rapidly be made greater than the demand, provided the demand were kept within reasonable limits, there is nothing to prevent a higher establishment of aeroplanes for each division in anticipation of future practice. In Europe the ration of aeroplanes to rifles is at present dominated by the difficulties of supply, both of pilots and of aeroplanes, and it should not be accepted as a standard by other less sophisticated races who are at last making an effort to bring their military power to a degree of efficiency commensurate with the force of their political claims.

COLONIAL DEFENCE.

The United States of America has from time to time inadvertently acquired colonies. These colonies, if they are to remain integral parts of the American Empire until they are considered capable of self-government, or until the decline of their material resources justifies their elimination from the Confederation of States, must be defended against external aggression or internal disaffection. Hence aeroplanes must be allocated to the troops entrusted with this duty.

The study under treatment lays down the axiom that special types of machines will be required for military work according to the geographical position and conditions of the various stations. Thus the garrisons in Hawaii and the Philippines and the Isthmus of Panama should be equipped largely with seaplanes—an inversion of British practice which gives the Navy a great number of land machines.

The alternative would be, obviously, the attachment of naval personnel and naval machines to units whose district is adjacent to large stretches of water. But there is much to be said for the American scheme in that the personnel employed, being military, would be initially conversant with their duties, and would possess that ready sympathy with the units of which they are a part necessary for efficient co-operation.

From the definition of the uses of aircraft in the United States the compilers of the study pass to a brief description of the types of aircraft and their development for warlike purposes. These they divide into "three principal classes: (a) Scout or speed machines; (b) reconnaissance aeroplanes; (c) battle aeroplanes," the respective duties of which need no detailed exposition.

It is pointed out that "the most important consideration in aeroplane construction has been the engine." Had this been realised by those in authority in this country some few years ago, and the necessary support and encouragement by subsidised competition given to British firms, the Royal Flying Corps would be to-day in a position nearer to a measure of aerial supremacy than any other belligerent nation.

The short life of an aeroplane engine is stated in a few words, and the consequent necessity for a large reserve supply is inferred.

One suggestion is made for which European experience gives no support. The writers speak with approval of the foundation of Government establishments for experimentation with aircraft engines. Far better results are attained by commercial effort assisted by ready purchases by the Government.

(To be continued.)

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AIRCRAFT IN THE HOUSE.

AIR SERVICES (CASUALTIES).

On April 18th, 1917, **Mr. Joynson-Hicks** asked what are the air casualties in killed, wounded, and missing in each of the last six months in the Royal Naval Air Service?

Dr. Macnamara: We do not think it altogether desirable to give the particulars asked for. In the event, however, of a Secret Session being held, I imagine my hon. friend would wish to take the opportunity of raising the matter.

Mr. Pemberton-Billing: Will the right hon. gentleman state to the House why it is undesirable to give the figures?

Mr. Joynson-Hicks asked the Under Secretary of State for War whether the Army Council has arrived at any decision to alter their predecessor's policy of giving particulars of air casualties; if so, what are the reasons; and, if not, whether he will give a list for each of the last six months stating the air casualties in killed, wounded, and missing on the Western front?

The Under Secretary of State for War (Mr. Macpherson): The answer to the first part of my hon. friend's question is in the negative, and the second part does not therefore arise. With regard to the third part, I think that the question might be raised in the event of a Secret Session being held.

Mr. Joynson-Hicks: Does my hon. friend realise that the last Army Council did not object to the publication of these figures; if there has not been any change why should not the request be granted?

Mr. Macpherson: So far as I know the last Army Council took the same view of the question as we do now.

Mr. Joynson-Hicks: Having regard to the importance of this matter to those of us who take part in the Secret Session Debate would it not be possible to provide some of this information earlier in order that we may be able to look over it before the Debate?

Mr. Macpherson: I cannot give any assurance as to that; but the hon. gentleman knows perfectly well that if any individual Member of the House cares to go to the War Office he will be shown the figures.

Mr. Joynson-Hicks: Thank you; I will.

Mr. Billing: Is the hon. gentleman aware that the present casualties on the front are the gravest reflection on the administration of the Air Service?

Mr. Macpherson: No; I am not at all aware of that.

UNITED STATES AIR SERVICE.

Mr. Billing (by Private Notice) asked the Chancellor of the Exchequer whether he will appeal to the Government of the United States of America to concentrate immediately on the construction and commission of a great Air Service, and also whether this Government is prepared to supply the American Government with sample machines, engines, drawings, and specifications of our latest and most successful types, and to render them every other possible assistance to this end?

Mr. Bonar Law: This subject is already under consideration with the Government of the United States.

Mr. Lynch: Would it not be wise to allow the Government of the United States to decide these questions for themselves on the ground that one of the great assets is an infusion of brains, which are badly needed?

R.N.A.S. RANK BADGES.

On April 19th, 1917, **Mr. Billing** asked the **First Lord of the Admiralty** whether his attention has been called to the confusion and dissatisfaction occasioned in the Royal Naval Air Service by the fact that there is no outward distinction between flight-lieutenant, flight-commander, and squadron-commander in the uniform of the Royal Naval Air Service: whether he is aware that in the Royal Flying Corps the following distinguishing marks have been adopted for these ranks: flight-lieutenant, two stars; flight-commander, three stars; squadron-commander, crown; and whether, under these circumstances, he will consider the advisability of introducing a regulation which shall permit flight-commanders to wear a small gold star above the eagle on the left arm, and squadron-commander a small golden crown in the same position, so long as they are attached to the Air branch of the Royal Navy?

Dr. Macnamara, in a written answer, said: The principle of distinction of uniform between the ranks of flight-lieutenant, flight-commander, and squadron-commander has been recognised by the Board of Admiralty; the details are now being worked out by the Departments concerned.

R.F.C. UNIFORMS.

Mr. Boland asked the **Financial Secretary to the War Office** whether, in view of the expense entailed on young officers attached to the Royal Flying Corps who would have to scrap their old uniform and provide themselves with a completely new kit if the proposed new instruction is enforced, steps will be taken to cancel it?

Mr. Macpherson: Officers posted from other units to the Royal Flying Corps will during the first three months of their service with the Corps wear their former uniform. Those who are posted direct to the Royal Flying Corps on first commission will wear Royal Flying Corps uniform. Officers who return from abroad

will conform within three months of their arrival in England, and officers serving at home by August 15th, 1917. These arrangements should obviate any hardship being incurred through the necessary change of uniform.

PILOTS (TRAINING).

Mr. Billing asked the **Under Secretary of State for War** what is the minimum number of hours' flying insisted on before pilots are sent to the front?

Mr. Macpherson, in a written answer, said: I regret that this information cannot be given publicly as it would be useful to the enemy.

AIRSHIPS (DESIGN AND CONSTRUCTION).

Mr. Billing asked what control the Air Board has over the design and construction of airships for the Royal Naval Air Service?

Dr. Macnamara, in a written answer, said: The Air Board have no control over the design and construction of airships for the Royal Naval Service.

THE AERONAUTICAL SOCIETY.

An important meeting of the Aeronautical Society will be held on Wednesday next, May 2nd, at the Society of Arts, at 8 p.m., when Capt. C. J. P. Cave, R.E., will lecture on "Some Meteorological Conditions which Increase the Risks of Flying." Sir Walter Laurence, K.C.I.E., will be in the chair. The subject of the lecture is of great interest to all who fly or hope to fly, so a large audience may be expected. Tickets may be obtained for visitors from the Secretary, Mr. W. Barnard Faraday, 7, Albemarle Street, W.

OFFICIAL NOTICE.

The following have been elected to the Aeronautical Society of Great Britain:—

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(Signed) W. BARNARD FARADAY, Secretary.

THE SUCCESS OF THE AERONAUTICAL HISTORY EXHIBITION ON TOUR.

The Aeronautical History Exhibition at the Grosvenor Galleries has proved a great success financially. Lady Drogheda has informed the writer that after paying all expenses £400 has been handed over to the Irish Hospital Depot's Fund, specially earmarked for the resultant products to be applied to the R.F.C. A further £400 has been handed over to the Royal Aero Club for the Flying Services Fund.

The collection of pictures and relics got together by Lady Drogheda is now being shown in various parts of the country, and the proceeds of these various exhibitions will be divided between the R.F.C. Hospital in Bryanston Square and Lord French's War Charities.

At present the exhibition is at Coventry, where it was opened on the 24th by Sir Arthur Ducros, Bart., M.P.. It will remain there until the beginning of May, when it will be removed to Liverpool, where Lord Derby, Minister for War, will open the exhibition at the Walker Art Galleries on May 12th. Thence it will be removed, after being on view for two weeks, to the Whitworth Gallery at Manchester, where the show will be open through Whit week.

At Birmingham 16,000 people visited the show in six days.

One is glad to hear that Lady Drogheda has received favourably the suggestion that she should organise an aeronautical garden party for the benefit of the Flying Services, if and when we are favoured with some fine weather. The success of such a gathering is beyond doubt, and one therefore ventures to make a further suggestion that Lady Drogheda should charge herself with the task of organising a proper exhibition of aeronautical war trophies in London. The photograph of the German Exhibition which appeared in last week's AEROPLANE indicates how such an exhibition has been organised in the enemy's country, and one feels sure that Lady Drogheda will have no difficulty in eclipsing it in London, especially as she can doubtless obtain the release from official bondage of so many interesting German aeroplanes of the most recent types hitherto hidden from British aeroplane designers.

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THE UNITED STATES AND THE WAR.

Judging from the reports in the American papers, the Military authorities in the U.S.A. anticipated the declaration of war with Germany by taking various steps to add to its aeronautical establishments. The preparations for the defence of the country against the Hun are announced with a bland and child-like simplicity, which almost suggests that there is something very deep behind it all. The following notes are collated from various American aviation papers:—

It is announced that a joint Army-Navy board is studying the Atlantic and Gulf coasts preparatory to the establishment of eight air stations, which will probably be equipped each with two airships and six or eight seaplanes. These air stations will probably also be used as bases for the 110-foot scout-boats, of which it is said that more than 100 have been ordered by the Navy Department.

Officers and men have been sent to the training station at Pensacola, Fla., for the necessary instruction before taking up their work at these stations.

It is said further that the personnel at each station is to consist of six officers and forty men—a number which seems barely adequate to handle eight seaplanes and two airships! The site for one station has already been chosen at Coco Solo, near Colon, Canal Zone.

* * *

Fifty officers and 350 men are under training for airship work at Pensacola.

The establishment of a seaplane base at Fort Totten is under consideration for the aerial protection of New York City.

The Naval Militia station, which operated at Bay Shore, Long Island, last summer, is renewing its activities, and the training of volunteer aviators will soon commence.

* * *

Lieut.-Col. John Bennett, 17th Infantry, has been detailed for duty in the War Department in charge of the Aviation Office, in succession to Brigadier-General George O. Squier, who is promoted to Brigadier-General.

It is interesting to note that at present the Aviation Section of the Signal Corps is not authorised to employ officers above the rank of Major. Therefore, Colonel Bennett cannot at present be appointed to the Signal Corps.

* * *

The present strength of the Aviation Section consists of one Major, 11 Captains, 65 Lieutenants, and 1,800 enlisted men—



Reproduced from "Aerial Age," New York.

Lieut.-Col. John Bennett, U.S. Army, in charge of the Aviation Office of the War Department.

which is a small enough beginning, even smaller than the original R.F.C.

* * *

The Conference Committee on National Preparedness, of which Mr. Henry A. Wise Wood is Chairman, gives the following figures regarding the condition of the United States Air Service.

According to "Aerial Age," New York, the information is said to have been compiled from data supplied by the War and Navy Departments.

Total appropriation for the year expiring June 30th, 1917, 13,281,666 dols.

Personnel.—Officers authorised, 77; enlisted men authorised, 1,800; present number of officers, including those detailed and retired officers on active duty, 96, and present number of enlisted men, 600.

Machines.—In service, 67 land machines, 4 hydro-aeroplanes, 2 flying-boats; total, 73. Ordered, 206 land machines, 80 hydro-aeroplanes, 16 flying-boats; total, 302.

In addition 5 captive balloons for field artillery fire control have been ordered.

A large airship of the Zeppelin type is to be constructed by a joint board of Army and Navy officers. They are not ready to say what it will cost or to give its dimensions.

NAVAL AERONAUTICS.

The status of the Naval Air Service is given as follows: The appropriation for Navy aeronautics available under the Acts of August 29th, 1916, to be available until June 30th, 1917, is 3,500,000 dols.

Personnel.—Officers authorised, 150; enlisted men authorised, 350; present number of officers, 53, and present number of enlisted men, 163.

Machines.—In service, seaplanes, 37; kite balloons, 2, and seaplanes awaiting decision as to disposition, 8. Ordered, seaplanes on order or awaiting acceptance, 40; kite balloon on order,



Reproduced from "Aerial Age," New York.

Brigadier-General George O. Squier, who retires from charge of U.S. Army Aviation.



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WESTON

1; kite balloon awaiting survey, 1, and airship undergoing trials, 1.

This table has been made a Congressional document, and printed in the Congressional Record.

* * *

It is reported that the Military Aviation Station at Chicago, Ill., has been transferred to Memphis, Tenn., under the command of Capt. Joseph C. Morrow, of the Signal Corps, the personnel consisting of 4 officers, 4 flying instructors, 8 student instructors, 14 enlisted men of the Aviation Section, 11 sergeants of the Signal Enlisted Reserve Corps, and 25 aviation mechanics. At present 16 aeroplanes are in use.

The aerodrome is established at the old Driving Park, and existing buildings were adapted as offices and store rooms and workshops, the aeroplanes being accommodated in tent hangars.

At the time this report was made, the Station had experienced 15 days of good flying weather, during which time more than 450 flights were made, representing 120 hours in the air. Additional aeroplanes have been delivered, and are about to be erected. Flying officers at the Station are Capt. A. Christy, officer in charge of training; 1st Lieut. W. R. Van Sant, Supply officer; 1st Lieut. William W. Spain, student.

* * *

An Air Station has also been established at Santiago, Cal., which is to be equipped with a squadron of fighting machines and seaplanes for the defence of the post. It is proposed to establish 12 seaplanes and 3 fighting triplanes with a personnel of 16 aviators and 160 mechanics.

* * *

It is reported that Major Wm. Mitchell, Capt. Carbury, and Lieuts. M. F. Harmon, jun., Devonport, and Johnson, of the Aviation Section Signal Corps, have gone to Spain for the purpose of studying aviation in various European countries.

* * *

A temporary Air Station has been established by the Aviation Section Signal Corps, U.S.A., at Essington, Pa., for the organization of the Philadelphia Aero Squadron, Signal Officers' Reserve Corps. Plant and accommodation is being laid down for a squadron of men and machines. Capt. William Ocker, who recently flew from Long Island to Washington, is in command.

* * *

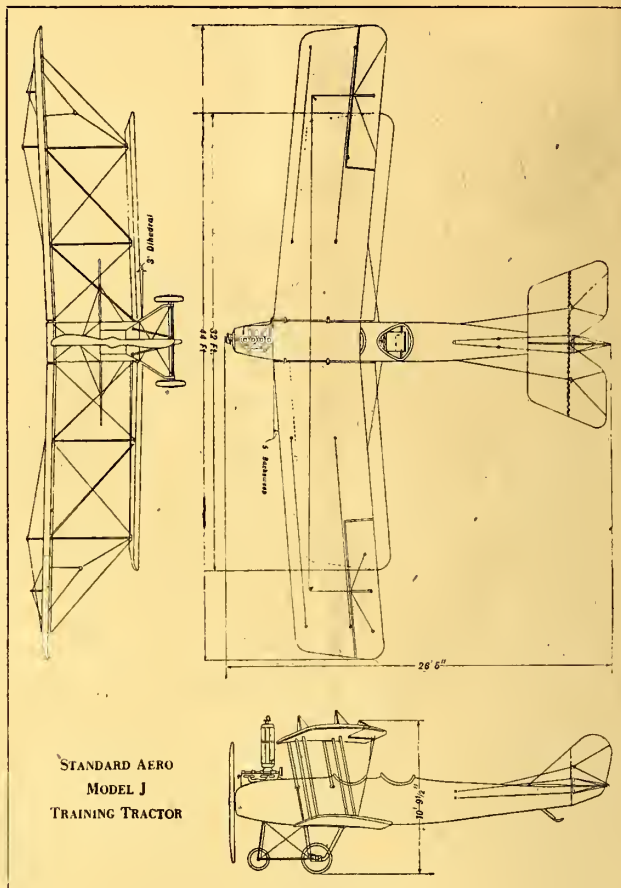
According to "Aviation," of N.Y., a good deal of useful work was done by U.S. Army Curtiss aeroplanes, type R-4, during last summer and autumn on the Mexican frontier. For a period of six weeks aeroplanes left Columbus, New Mexico, every other day for General Pershing's Headquarters at Colonia, Mexico, about 115 miles south, the return trip being made the next day. All first-class mail for troops was carried by aeroplane, and, on some occasions, as much as 300 lbs. weight was taken, bulk rather than weight being the limiting factor. Not a single piece of mail was lost during the existence of the post.

The equipment of the machine included food, water, tools, first-aid kit, sleeping bags, two spare magnetos (a very sensible provision), butter, bedding, candy, and jam. Presumably, the balance of the edibles was for the benefit of the people at the other end, as one can hardly imagine the pilot and passenger of an aeroplane requiring 10 lbs. of jam or 30 lbs. of butter for a flight occupying 1 hour and 15 minutes.

April 1, 1917

AVIATION

217



The American "Aerial Age" Weekly describes the new Model H.12 Curtiss flying-boat, which is now under construction for the U.S. Navy. It is said that previous boats of this type have already been supplied to European Powers, and a few details, therefore, are not without interest.

The H.12 is a twin-tractor flying-boat with two 200-h.p. Curtiss engines.

General dimensions: Span (top plane) 92 ft. 8 1/2 in.; span (bottom plane), 66 ft. 11 1/2 in.

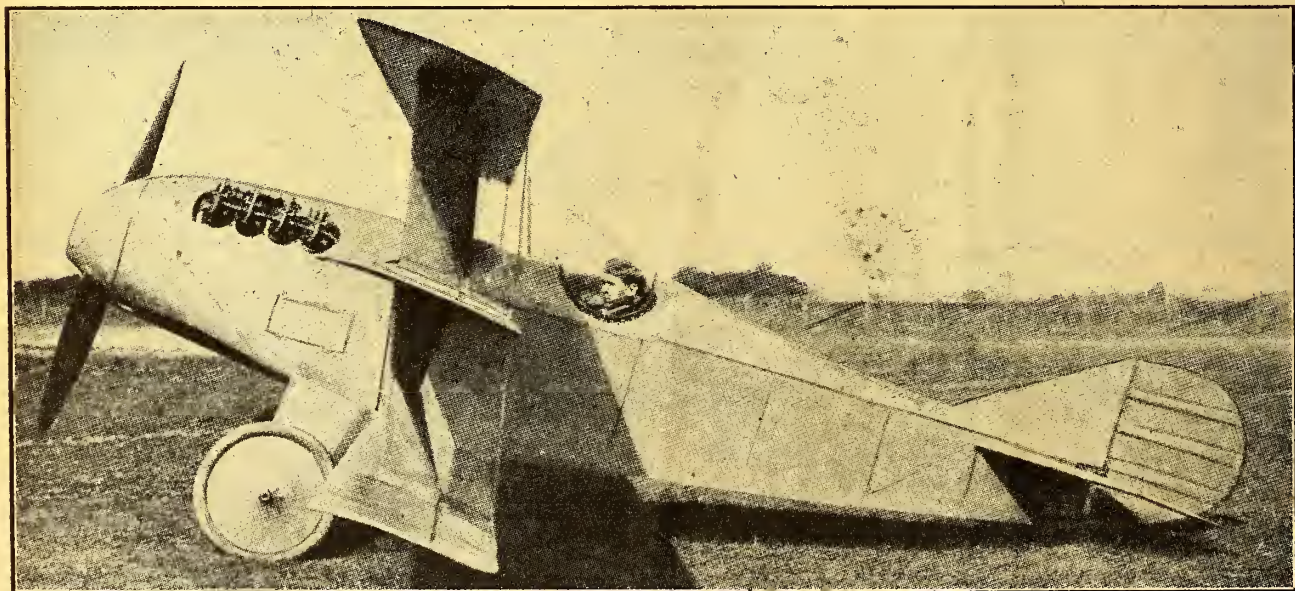
Total surface, 1,120.78 sq. ft.

Gap, 8 ft.

Total height, 16 ft. 9 in.

Net weight of machine (empty), 5,945 lbs.

Useful load, 2,044 lbs.



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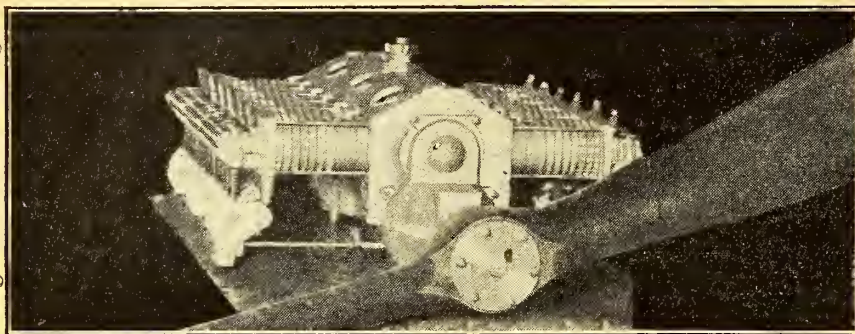
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The 100-h.p. Ashmussen Air-cooled 12-cylinder horizontal engine.

The speed range of the boat is said to be 55-85 m.p.h.

The general construction of the boat hull follows standard Curtiss practice in vessels of the "America" class, and has an enclosed cabin streamlined into the hull, and fitted with celluloid windows.

The engines are mounted between the planes in ∇ bearers made of steel tube, and are cooled by circular radiators arranged in front of each engine and behind the air-screws, which are of small diameter and high pitch. Petrol and oil are fed under pressure from tanks in the hull of the boat.

* * *

It was reported from Washington on April 11th that Mr. Baker, Secretary for War, has prepared a communication to be addressed to American aviators in the French air service, stating that the United States recognises the services which they are rendering, and desires them to remain at the front, as they are doing more important work there than it would be possible for them to do at home.

It has already been reported that the "Lafayette" Squadron of American aviators now at the French front have decided to wear their own country's uniform and to fight under the United States flag. These sportsmen, therefore, have the honour of being the first Americans to represent their country officially in the present international argument.

* * *

An Ottawa telegram states that Quentin Roosevelt, son of the ex-President of the United States, will take the aviation course at Camp Borden and qualify for overseas service with the Canadian Flying Corps or with the American Expeditionary Force if the latter is sent.

* * *

Searchlights, each of more than 1,000,000 candle-power, have been installed at the United States Army Aviation Field, at Hempstead, New York, to facilitate night flying.

* * *

Army officers have been sent from Washington to the Panama Canal zone and to Hawaii to attend to the organisation of flying squadrons for the U.S. army in those places.

* * *

In the teeth of bitter weather twelve army aviators started to fly from Mineola to Philadelphia on December 30th. Eight of these arrived at the Philadelphia Navy Yard, and the others, having trouble, were forced to descend before completing the trip. The machines that finished landed in the following order:—

Lieut. Coyle, of the New Hampshire National Guard, with a passenger, 11.34 a.m.; H. W. Blakeley, with C. H. Reynolds, passenger, 11.40 a.m.; "Tex" Millman, with S. A. Blair, 11.45 a.m.; Capt. J. E. Carberry, Army Signal Corps, 11.50 a.m.; Lieut. James E. Miller, New York, 11.52 a.m.; Lieut. G. Osborne, 11.53 a.m.; Leonard Bonney, with Instructor Allen, 11.56 a.m.; Lieut. E. W. Bagnell, with Sergt. E. A. Kreuss, 1.30 p.m.

The best time was made by Lieut. Coyle and Corpl. Salmon, who covered the distance of 115 miles in 97 minutes.

Lieut. Norbert Carolin, with Lieut. Wheaton as passenger, crashed into a fence at Deans, N.J., after motor trouble forced them to descend. Both planes of the machine were smashed, but the men escaped injury. Sergt. E. W. Noyes, with a passenger, descended on the outskirts of Monmouth Junction, N.J., without difficulty. Capt. Raynal C. Bolling descended at Monmouth, N.J. Lieut. Kilner and John B. Stetson, jun., of Phila-

delphia, a passenger, abandoned the flight shortly after the start.

H. W. Blakeley, in landing at the League Island Navy Yard, struck a flag-pole, and his machine hit the ground at a sharp angle. Its nose stuck fast in a little trench, but the pilot and his passenger were uninjured, and the machine was repaired in time for the return flight on the following day.

Seven of the eight machines that reached Philadelphia left for the return trip on the following day, and five of them reached their destination without incident. Lieut. Arthur Coyle and Sergt. Kreuss were forced to descend on account of engine trouble. Lieut. J. E. Miller was the first to reach the Mineola field, 1 hr. 26 min. after starting. He was closely followed by Capt. J. E. Carberry, of the U.S. Signal Corps, and Sergt. Salmon. Leonard Bonney completed the flight in 1 hr. 18 min., while H. W. Blakeley's time was 1 hr. 12 min.

* * *

Lieut. Arthur Coyle, of the New Hampshire National Guard, was forced by engine trouble and a broken propeller to alight in the water at Princess Bay. He was drowned, but unhurt.

* * *

Mr. Earl L. Byers has contracted with the United States Government to carry mail by aeroplane in Alaska for £9,900 annually.

The flying postman will make two trips a week between Nome and a camp 381 miles inland. He will carry both mail and passengers, and his service will bring the mining camp three weeks nearer the outside world.

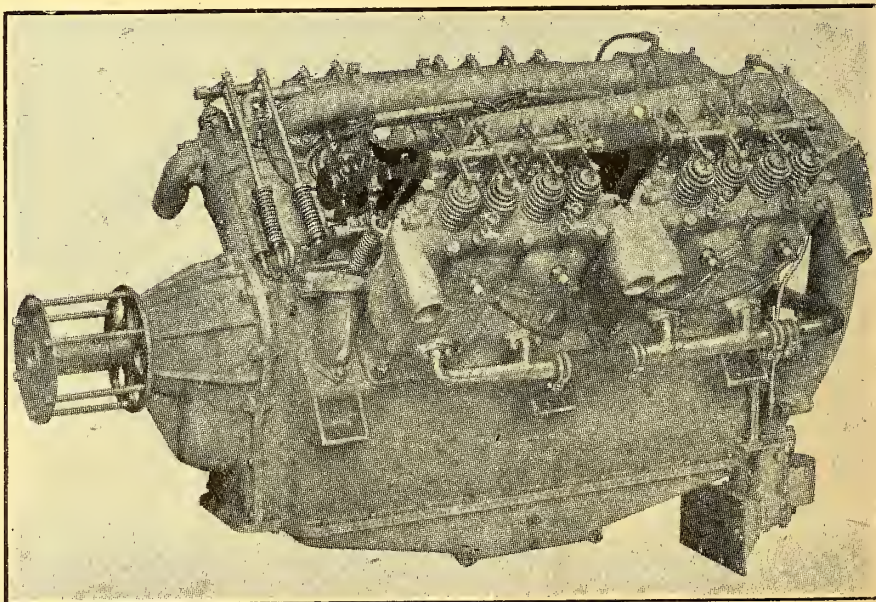
The country over which he will fly is mountainous, there are no level tracts on which to make a landing in case his engine should stop, and in winter the snowfall is between 25 and 30 ft. deep. Even should Mr. Byers' aeroplane effect a safe landing in the snow between terminals, it would be almost impossible for him to get away again.

Mr. Byers carried four passengers on a trial trip, the weight being 1,000 lbs.

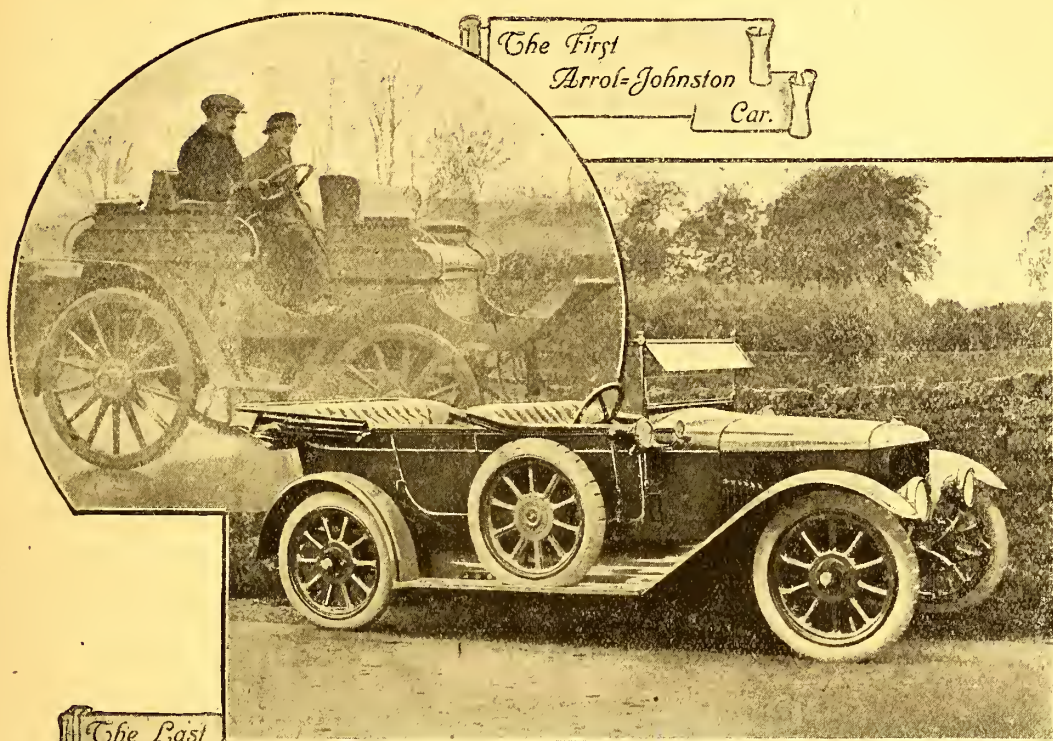
The proposal is typical of American enterprise, but even if Mr. Byers flies for only a year without deteriorating anything more than the colour of his hair, he will have earned his fee.

* * *

It was reported from Paris that on April 23rd French, British, Belgian and American aviators have begun to scatter over the German lines half a million copies of President Wilson's address to Congress of April 2nd last declaring a state of war with Germany. It has been translated into German at the American Embassy there, and printed at the Imprimerie Nationale for the "New York World." It gives the whole text of Mr. Wilson's address, but those parts which have already been published in Germany are printed in black, and those which have hitherto been suppressed in Germany are printed in red ink. A perusal of the pamphlet shows at once that nearly three-fifths of Mr. Wilson's address was suppressed in Germany.



The 8-cylinder, type 5a, Sturtevant engine of 140-h.p. at 514 lbs. (See pages 1050 and 1058.)



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America's Aeronautic Needs and Possibilities.

(Extracts from an article in "Aviation," New York, by DR. CHARLES D. WALCOTT,
Chairman of the National Advisory Committee for Aeronautics).

Congress has generously responded this year with large appropriations with which to establish air fleets for both the Army and Navy, and yet a careful review of results accomplished thus far clearly indicates that with the passing of the first year of our active aerial programme we hardly made a beginning.

The aeronautic industry's inability to meet the needs of the Government is in itself only another example of the fact that though millions may be available for a specific purpose in time of great need no amount of money will buy time. Even the most generous appropriations do not open up the years that have passed and enable us to carefully lay the foundations of a great industry and a great aerial arm through the education of engineers, manufacturers, teachers and all of the wide variety of personnel required. [The lack of industrial organisation in American aviation is only another case of history repeating itself.—Ed.]

The aeronautic industry requires Governmental support in its development, and this it has not received in the past in this country in a measure sufficient to enable it to meet the present enormous demands that have suddenly been made upon it. During the eight years prior to 1916, the Army ordered 59 aeroplanes and received 54. These were all supplied by four makers, and the largest number ordered from any one maker was 22 machines, not a very large amount of encouragement over a period of eight years.

During 1916 the Army ordered 366 planes and received 64. These planes were divided up among nine factories, which factories represented practically the entire producing capacity of the country. Whatever the industry may produce during 1917 is bound to fall far short of the country's needs, and our object now is to ascertain how the situation may be helped.

The potential fighting strength of this country, if properly trained and equipped, is greater than that of any of the European countries with the possible exception of Russia.

We want all types of aeroplanes in large quantities for training, reconnaissance, bomb-dropping, fighting, etc., for both Army and Navy use. We want them as good as, or better than, the best European types. We want the skilled aviators in equally large quantities.

At the present time there are not more than 12 aeroplane manufacturing organisations in the United States with the necessary engineering and manufacturing experience and facilities to justify Government business.

There are many estimates of our reasonable needs, and the one presented in Table I has been prepared after conferences with as many men as could be reached who have experience or judgment qualifying them to express an opinion and after obtaining as much data as possible from Europe.

TABLE I.

TENTATIVE ESTIMATE OF ANNUAL REQUIREMENTS OF AEROPLANES
(ASSUMED TO BE POSSIBLE OF ACCOMPLISHMENT IN 1919).*

Attached to an army of 1,000,000 men, that is one plane per 1,000 men.....	1,000 planes and 1,000 aviators
Attached to our fleets at sea ...	200 planes and 200 aviators
For harbour and seaport de- fence	800 planes and 800 aviators
	2,000 2,000
For training pilots (planes worn out or broken)	2,000 planes and 400 aviators
	4,000 2,400

The last item, of training machines, is arrived at as follows: It has been found best to divide the students into assignments of five per instructor. European experience shows that it takes at least nine months to produce a properly trained advanced military aviator, and that it costs approximately one and one-half machines in wear and tear and breakage for each finished aviator. The breakages are most often made by the men who fail to qualify.

Assuming that it would be desirable for many reasons to limit each military aviator's active duty, exclusive of war time, to one year, then we must each year produce 2,000 new aviators. Disregarding failures, 400 instructors should each turn out five finished advanced military aviators, each with a minimum of nine months' instruction.

It is probable that the longer the time allowed and the more careful the instruction the lower would be the percentage of planes used up per aviator. Instead of one and one-half planes

per aviator we have figured only one, or, at the rate of 2,000 planes per year to produce the 2,000 finished fighting pilots.

To facilitate this necessary increase of output, without the opportunity at the moment of increasing the number of different sources of supply, demands the closest co-operation between the Army, the Navy and the industry in order to eliminate every stroke of unnecessary effort, and in order to concentrate all our activities upon the fewest number of types and designs of each that will completely meet our needs.

It is entirely unnecessary, for instance, to have five companies all producing a different design of training machine to do the same work. One of the five is best, and when determined should be made the standard until a better is developed.

Again, with so few sources of supply, it is imperative in the interest of efficiency not to have every manufacturer producing every type, but, for instance, to allot all of the types where they can be best produced.

It is highly desirable at this time that there should be a very active campaign carried on in the standardisation of the more common parts and fittings of planes and engines so that when we may have arrived at such an output as 4,000 planes per year there shall be the greatest degree of interchangeability of those parts and fittings in the interest of prompt field repairs. It is also important that all of the materials themselves should have standard specifications acceptable to Army and Navy alike.

Much can and should be accomplished in reconciling the many differences that exist between the inspection systems of the Army and Navy as affecting aircraft. There is room for some simplification, for the removal of some duplication of effort between the departments and between them and the manufacturers, and for a standardisation of practice.

In order successfully to speed up production, plans will have to be laid at once and steps taken, preferably by the Government, to provide in advance of actual need the different kinds of material that are hard to obtain, but which must be available in large quantities. For instance, if the industry is to produce 2,500 planes during 1918 and 4,000 during 1919, then there should be about two and a half million feet of spruce air-drying right now for next year, and we should be laying down four million feet to take care of the year after.

From the standpoint of our national defence it is imperative that patent matters be not allowed to impede this very vital industrial growth. Congress recently appropriated one million dollars for the purpose of acquiring by purchase, condemnation, donation, or otherwise any basic patent or patents that may be necessary to the developments of the industry. It is not the desire of the National Advisory Committee on Aeronautics, in whose hands the matter rests at the moment for recommendation, to condemn or purchase any patent. It believes that such action would be construed as indicating an unreasonable attitude of mind on the part of the owners of the patents condemned or purchased—besides, perhaps, serving to discourage invention, if the settlement was made on too low a basis or to encourage all sorts of claims upon the industry and the Government, if such settlement was on too high a basis.

The committee is, therefore, working diligently upon the proposition of arranging an adjustment out of court, whereby just recognition will be made to the owners of the more important or basic patents in the form of reasonable royalties to be paid by the purchasers of planes whether for military or civil use.

Some difficulty has been experienced at times through inability to secure tests of finished planes. The present requirements that every machine produced be tested against its specifications sometimes works a hardship on the manufacturer, who must keep his product moving, and his capital turning over, when a long spell of bad weather precludes test flying. This situation will probably grow much worse instead of better as the result of a rapid expansion of the industry, and calls for careful consideration and some revision of the present arrangements, in order to still arrive at the same result without inconvenience or handicap to the industry.

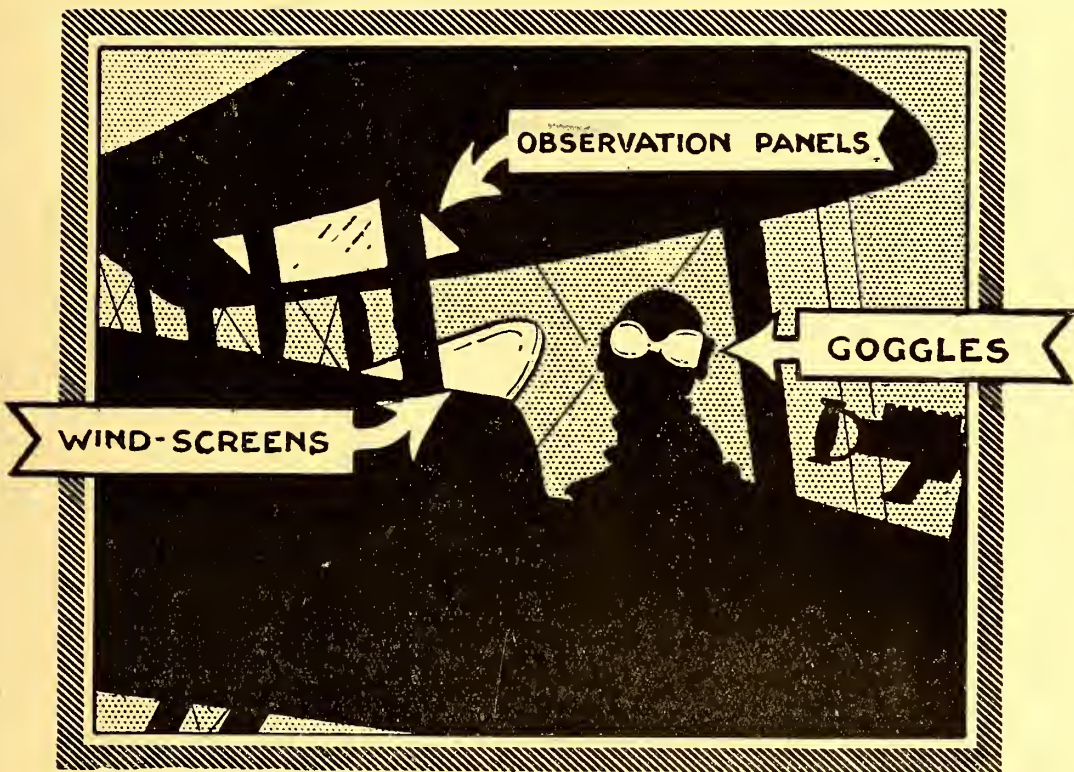
One of the really serious problems is the matter of obtaining enough competent instructor aviators to teach the very large number of young men who are applying for commissions in the Officers Reserve Corps, Aviation Section. It is apparently going to be just as serious a matter to build up an adequate force of teachers of the advanced science of military flying as now practised abroad, as it is to produce the machines that are to be flown.

[Dr. Walcott is unduly pessimistic. If the U.S. Army concentrates on a big fleet of bomb-droppers and fighters, for its protection, and leaves the more technical work of reconnaissance to the European Allies, a useful air fleet for this war can be produced in a very short time.—Ed.]

* In war time each plane in the air would need three in reserve besides one broken up training the pilot

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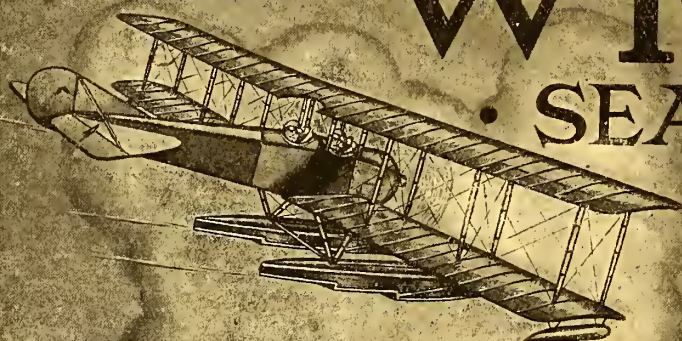
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The British Aircraft Industry.

BY CHARLES L. FREESTON.

(Founder Member of the Royal Aero Club.)

XIII.—THE BEATTY SCHOOL OF FLYING.

Good American though he be, Mr. George W. Beatty may legitimately be claimed as part and parcel of the British aircraft industry, for he is building not only machines at Cricklewood, but also engines of his own design, by British labour and of British material throughout. Extraordinarily simple of construction, but wonderfully efficient, the Beatty aircraft motor is probably unrivalled for the purpose of school machines, and it holds the proud record of never once having stopped in the air during a pupil's flight.

A MARVELLOUS TRICK FLIER.

Habitues of Hendon will remember the sensation caused by Mr. Beatty's dramatic appearance upon the scene in July, 1913. The art of flying was pretty well advanced in those days, but save in the case of that prodigy of the air, M. Chevillard, nothing so daring and so remarkable as Mr. Beatty's bankings had ever been witnessed at the London Aerodrome. His "trick flying" made the crowd gasp and the professional aviators marvel, and appeared to suggest that the Wright machine and the Wright School of fliers were still capable of astonishing the world.

AN ADVENTUROUS CAREER.

In the nature of things the skill which Mr. Beatty displayed to the delight of London spectators had already made him famous in the country of his birth, and, as a matter of fact, his flying career in America had been an almost continuous record of startling achievements. He qualified for his pilot's ticket on August 4th, 1911, at the Nassau aviation ground, and received the coveted award from the Aero Club of America on August 31st, at which date he was 24 years of age. The machine he used was a Wright, and he was a pupil of the Wright schools, at Dayton, in the first instance, and finished his course at Hempstead. His interest in aviation science, however, was of much older date, and, in 1909, he was studying automatic stability, and experimenting with a model of his own construction to which he had attached a pendulum.

EARLY ENTHUSIASM.

No man, perhaps, ever stood less on the order of his going as soon as he had passed his pilot's test. He could hardly stay on the ground, and only three days later he took up Miss Anna O'Hagen, of New York, on a passenger flight of 12 miles across country, and over the ocean at Long Reach. After dinner, they

flew back again by a roundabout course, and completed a "joy ride" of about 30 miles in all, having been in the air for 40 minutes. A flight of this description was a novelty to the American public six years ago, and the inevitable interviews followed, and Miss O'Hagen (now Mrs. Beatty) loyally declared, "I was not a bit afraid, because I knew George would not let any harm come to me." A day or two later, Mr. Beatty won a cup from the Aero Club of America by making a passenger altitude flight of 3,100 ft., with Mrs. Percy L. Reynolds on board. The flight constituted a record for America at that date.

THE CHICAGO MEETING.

Then came the great Chicago meeting, at which, only eight days after qualifying for his ticket, Mr. Beatty won 13,000 dollars in prizes. He attained an altitude record of 7,703 ft., and also beat the world's duration record (with passenger) of 3h. 10m. made at Mulhausen by flying for 3h. 42m. 22 1-5secs. The altitude performance, by the way, with a 4-cylinder engine of 35-h.p. only, was distinctly noteworthy. The Chicago meeting was an international affair, with no less than 88,000 dollars offered in prizes and 38 entrants, among whom were Mr. T. O. M. Sopwith, MM. René Simon and René Barrier, from France, and the best of the American pilots, including Mr. J. A. D. McCurdy and Mr. Walter H. Brookins. During the meeting, Mr. Beatty ascended to 5,000 ft. with a well-known newspaper man, who described his experiences in graphic fashion in the "Chicago Examiner," and, referring to the imperturbability of his pilot, remarked that "the aviator, with his smileless jokes, was a model for an ice-house."

PHOTOGRAPHY AND WIRELESS TELEGRAPHY.

The first photographs ever taken in New England from an aeroplane were secured in the same month from Mr. Beatty's machine.

In September of 1911, moreover, he took up a wireless operator at Brighton Beach. Messages were transmitted from the aeroplane at an altitude of 1,000 ft. to the grand stand on the Beach track. A number of experts had assembled to witness the tests, and pronounced them an entire success. At Brighton Beach, also, Mr. Beatty made a flight with two lady passengers at one time. Already, it may be mentioned, he had broken the American record for a sustained flight with two passengers at Grant Park, before a crowd of 600,000 spectators.



Mr. George W. Beatty.

HIS FIRST FLYING SCHOOL

Having gained all these laurels within a month of his début Mr. Beatty set up a flying school at Kinloch, St. Louis. Then in November he had a small misadventure. He was carrying Mr. Percy Noel, the editor of the "Aero," at Kinloch Park, and when at an altitude of 1,200 ft. the magneto failed and the engine stopped. Darkness was coming on, but the pilot did a spiral dive and contrived to land in safety. On another occasion he enjoyed the novel experience of having his propeller cranked by a priest, after landing in the grounds of a seminary and being hospitably entertained by the inmates.

ROMANCE IN THE AIR.

About this time he was very much in the public eye by reason of the fact that the papers made much of the frequent flights. With Mr. Beatty of a lady who always wore a mask and refused to give her name, on the plea that her relatives were averse from her enthusiasm for the air. Photographs of Mr. Beatty with the masked lady seated at his side were a familiar feature of the American journals for some time; eventually the lady proved to be Miss O'Hagen. Incidentally, it may be mentioned that Mr. Beatty's proposal of marriage was made in the air!

A CHAPTER OF ACCIDENTS.

Another big aviation meeting was held in January, 1912, at Brighton Beach, and on one of the days a singular chapter of accidents was chronicled. Mr. Beatty crashed into a fence, Mr. Claude Grahame-White dug the nose of his machine into a marsh, and Mr. Sopwith dropped into the sea from 200 ft. right in the midst of a group of bathers. The landing at Brighton Beach, it may be mentioned, was very bad; hence these contretemps. An interesting fact to be noted in passing is that it was in this month that Mr. Clifford B. Prodger, now well known in England as a tester of conspicuous ability, and the pilot of the Handley Page bomb-dropper which carried 20 passengers to a height of 7,500 ft., obtained his ticket from the American Aero Club as a Beatty pupil.

A RECORD THRILL.

Mr. Beatty took up three passengers for the first time on January 19th, and then came the thrill of his life, and one such as has never been equalled in flying history—war-time episodes apart. He took up one day as a passenger Mrs. Dunlap, the wife of a well-known millionaire. She had expressed much interest in aviation, but had been rallied by her friends on the subject of never having been up in the air herself. All was going well, and Mrs. Dunlap was enjoying the flight, in spite of the cold, when the petrol froze and the engine stopped.

Then the lady's nerve gave way, suddenly and completely, and she had a fit of violent hysterics. I remember in my young days being told of a lady who, while out in a rowing-boat on a somewhat choppy sea, became frantic and "wanted to get out and walk," and for many a year the story remained as a mental picture of the absolute limit to which feminine folly could attain. But Mrs. Dunlap went one better, for she stood up on the aeroplane and tried to jump out. Mr. Beatty had to turn half round, hold the lady down by main force with one arm, and manage the controls as best he could with the other. He could not descend in a long glide, moreover, because of the character of the ground, and was obliged to circle. The difficulties of the undertaking were clearly apparent to the spectators as the machine neared the earth, with the lady visibly in a frenzy of fright and the pilot doing his utmost to avert disaster.

His efforts were successful, and he landed without a crash. To quote a current description of the event, "It was found that Mrs. Dunlap's copious tears had frozen upon her cheeks, and she required medical aid before she could go to her home." As for Mr. Beatty, he may have felt that fate could not hold out any more trying experience for the future, short of a broken plane, and was probably thankful that he had attained and survived the last degree of imaginable danger; but, where neurotic femininity was concerned, his motto must assuredly have been "Never again!"

A DESCENT IN NEW YORK.

An interesting achievement of Mr. Beatty's was that of being the first aviator to descend in the heart of New York City. The day was too windy for instruction purposes, so he took a jaunt on his own account, and flew the 17 miles from Nassau to New York. Looking out for a landing place he decided upon the oasis of Central Park, which is right in the middle of the city. But the place where he landed had been railed off, as it happened, to give the grass a rest, and when all the children in the vicinity climbed over the fences to see the machine, and trampled on the grass, there was no end of a row with the police, who threatened to remove the aerial intruder to the lock-up. However, by pretending that his descent had been involuntary, he managed to avert that indignity.

When he flew back the next day he struck the coldest patch he had ever experienced. At 3,200 ft. the thermometer registered 38 deg. of frost, and it must be remembered that this was on an open machine, with the engine behind, which is not

quite the same thing as a modern tractor with an all-enclosed fuselage. Small wonder that the pilot's ears were nearly bitten off and his hands and legs were almost rigid when he landed. A good rubbing, however, with alcohol set matters right.

THE FIRST "SKY AMBULANCE."

A mishap to a brother-aviator, Mr. Oliver D. Sherwood, provided the first occasion on which an aeroplane was used as an aerial ambulance. Mr. Sherwood nose-dived to the ground on Long Island, and Mr. Beatty, on seeing what had happened, flew to the spot as fast as his machine would carry him. He found Mr. Sherwood dazed and weak, and so tangled in a mass of wires, spars and canvas that it required the help of several persons to pull him out. He was then placed on the spare seat of Mr. Beatty's machine. The journey of several miles through the air to the Nassau Hospital revived Mr. Sherwood's energies, and by the time the hospital was reached he decided that he was in no immediate need of medical attention, and Mr. Beatty therefore piloted him back to his hangar. Naturally, this impromptu employment of the aeroplane in a new direction was greatly to the fancy of the Press, and the novelty of the "sky ambulance" was duly enlarged upon.

Mr. Beatty also amused the public about this time by flying to a police-court to answer a charge of "speeding" on his automobile.

A RISKY ESCAPE.

Then he did a "stunt" which he admits was foolish—the most foolish thing, in fact, that he ever did in his life. Mr. Lee Hammond, a well-known aviator, had arranged a quiet wedding, and was eloping with his bride by train. His confrères, however, had got wind of the transaction, and to the surprise of the bridal pair they found themselves being bombarded with rice and old shoes as they stepped on to the train, the showers coming from a couple of aeroplanes, piloted by Mr. Beatty and Mr. Marshall Reid. But a thick fog prevailed at the time, and Mr. Beatty followed the train through this for a distance of a dozen miles, flying only 20 ft. above the cars.

DICTAPHONE EXPERIMENTS.

The known difficulty of communication between passenger and pilot induced Mr. Beatty to take up Mr. W. Kimball, the inventor of the dictaphone and dictagraph. They used a couple of instruments of the latter type, and found that they could converse quite easily even when flying in a strong wind.

A BAD SMASH.

The worst smash that Mr. Beatty ever experienced occurred on Staten Island. Owing to engine failure at a low altitude, he had to make a forced descent, with Mr. Marshall Reid, on a farmstead, and the machine landed in a pig-run, overturned itself, and was smashed against a fence. His most remarkable flight on a small machine he considers to be one which he made with five passengers, whose weight, excluding his own, amounted to 845 lbs. With this load he flew four miles.

EXPLOITS AT HENDON.

In July, 1913, Mr. Beatty came to England in order to give demonstrations on an Orville Wright machine fitted with a 50-h.p. Gyro rotary motor. This machine, by the way, was the same 'bus that he had been using for two years. As already indicated above, the exhibitions of thrilling flying which he put up at the London Aerodrome were in every way amazing. He took part in the Hendon aerodrome races, and also flew with three passengers for 20 minutes, but did not indulge in any cross-country flying.

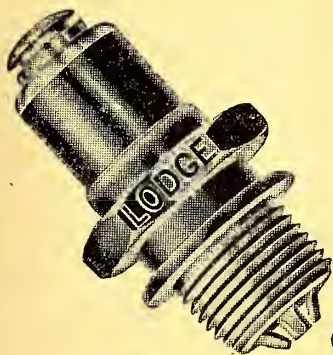
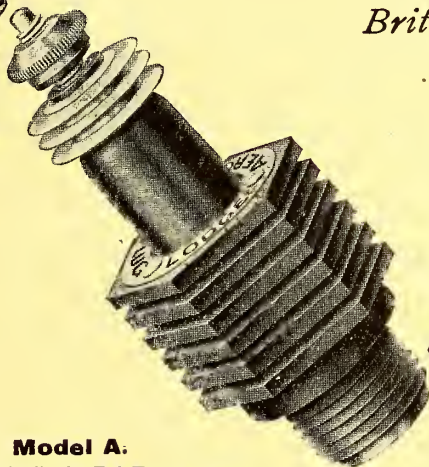
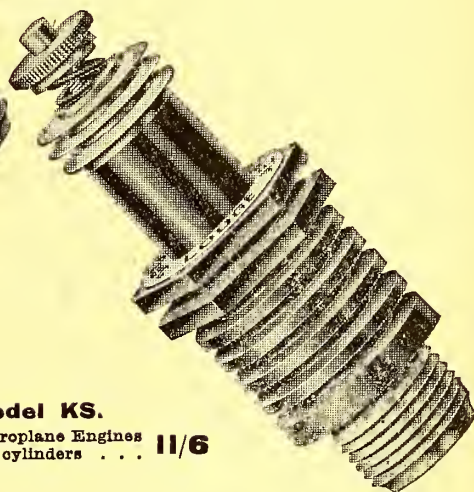
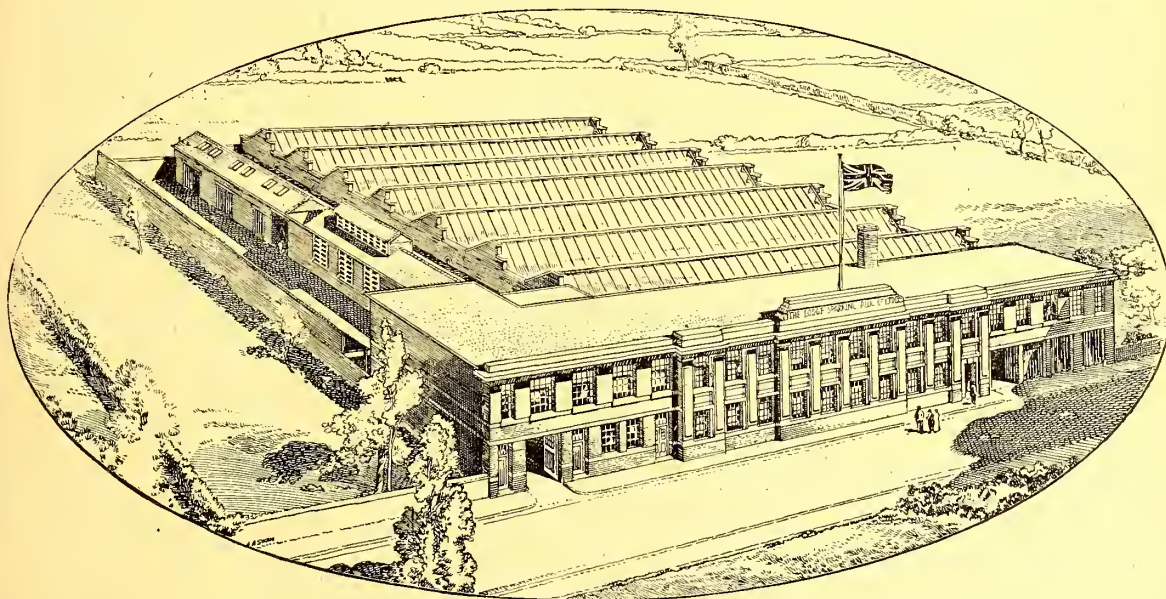
THAT BIT OF STRING.

It was noticed at the time, by the way, that Mr. Beatty always carried on his machine a piece of string attached at one end to the cross-bar between the blinkers. It served the purpose of warning him as to the dividing limit between safe banking and actual sideslip. So long as the string was flying parallel to the blinkers he knew that he had an axial relative wind, and was therefore certain that he was not over-banking.

THE HENDON SCHOOL.

While at Hendon he had trained a mechanic to fly in two days, and several people who had observed his methods asked him why he did not start a school over here. He returned to America for the winter, but at length decided to adopt the suggestion, and when he returned to England in April, 1914, he rented a shed at the London Aerodrome and began to take pupils, whom he trained with success. He had even as many as 88 at one time.

He could not get an engine to please him, however, and decided to build one himself, and the Beatty monobloc was the practical result. Then came the war, and with it the taking over of his flying school by the Government. He has had the satisfaction of turning out many skilled pilots, who have distinguished themselves in various fields, and include many winners of the Military Cross and several D.S.Os., while one pupil sank a German submarine in the Channel. The outcome of his successes is seen in the new developments at Cricklewood, which were mentioned in THE AEROPLANE of last week.

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THE NEW YORK AERO SHOW.

By A. TUCKERMAN.

[Owing to accidents at sea, this is the first report of the New York Show which has reached this paper. It only purports to be a brief personal opinion of one who has seen much of European aircraft.—Ed.]

The first Pan-American Aero Show opened at the Grand Central Palace on Feb. 8th. The public exhibited considerable interest, which was, no doubt, accentuated by the critical state of relations with Germany; this turned the mind of the average man to matters military and naval.

On entering the building the visitor discovered the original Wright biplane, famed for its flights at Kilty Hawk, North Carolina, in Dec., 1903, with the same crude but hard-working old motor that helped to win its fame. Contrasted as it is with the aeroplanes of to-day, it brings one to a realisation of the tremendous strides aeroplane construction has taken during the past decade.

EXHIBITS.

The Wright-Martin Corporation exhibited two tractor biplanes of military type. Model R. is a reconnaissance biplane of 50 ft. span and 26 ft. length, fitted with Hall-Scott 150-h.p. motor. The method of mounting motor and radiator is reminiscent of Aviatik practice. The planes are slightly staggered. 90 m.p.h. is claimed; climbing speed, 3,500 ft. in 10 minutes.

Chief interest centred on the new model V. tractor of 39 ft. span, 27 ft. length, and equipped with one of the new Simplex Hispano-Suiza motors (150 h.p.). The fuselage of this biplane is rounded and the motor completely enclosed, thus differing entirely from the model R. with rectangular fuselage and semi-enclosed motor.

Curtiss showed one of the F. flying boats with O.X. 90-h.p. motor, a machine by now familiar to Englishmen, and a large twin-motored military biplane equipped with the Sperry automatic pilot and a Davis non-recoil gun mounted in the central nacelle. On the Curtiss Stand was the pièce de resistance of the Show, the new Curtiss "Autoplane," a large pusher triplane fitted with 100-h.p. motor. Passenger accommodation is in an enclosed automobile body which has a four-wheeled chassis. The body has windows and is well upholstered inside, the pilot is forward (with single Dep. control), and behind seats for two passengers.

The whole appearance is striking to a degree, but whether the machine is a success in the air I do not know. The head resistance is bound to be considerable. There is a four-bladed propeller mounted behind the limousine and driven by shaft and counter-shaft from the motor.

The other Curtiss exhibit was one of the well-known J.W. B. military tractors which are being used by the U.S. Army.

Of considerable interest was the little sporting model biplane built by the Samuel Pierce Corporation, a remarkably neat little machine of 26 ft. span. Motive power is supplied by a Pierce 3-cylinder radial motor which follows Anzani practice. The claimed speed range is 38-50 m.p.h. The machine is, of course, a single seater. Great attention has been paid to the streamlining of this little machine. Noticeable is a peculiarly neat method of carrying the exhaust through nickel pipes under the lower plane and between the chassis wheels.

A handsome biplane was on exhibition at the L. W. F. Company's Stand (L. W. F., by the way, does not stand for any terrifying Hunnish corporation, it merely means Laminated Wood Fuselage). It is a type V. tractor with slightly staggered planes swept back "pfeil-fashion." The general workmanship appears strong. The motor, mounted under an aluminium hood, is a Thomas.

Burgess exhibited a large Burgess-Dunne seaplane of the central float type, familiar through numerous photographs to English readers.

The Thomas-Morse Corporation showed a Thomas-Morse military tractor of strong appearance equipped with Thomas 135-h.p. motor. The span is 52 ft.

On the Standard Aero Corporation's stand was a Standard stock tractor with Hall-Scott 125 h.p. motor, a sturdy looking biplane of a type being ordered in considerable numbers by the United States Army.

Benoist showed one of the well-known Benoist short-hull flying boats with 6-cylinder Roberts motor.

Other exhibits included a small biplane of the Caudron type fitted with floats, for training purposes; this is built by the J. D. Cooper Corporation. There is a sad little notice on the aeroplane which informs us that its motor was "lost in transit."

The Aeromarine and Witterman-Lewis stands both showed tractor biplanes of conservative design and strong appearance.

Facts most noticeable at the show were that practically every aeroplane shown was a tractor, that all were biplanes, and that the Deperdussin type of control is almost universal. The general standard of workmanship shows that American aeroplane constructors are making rapid progress.

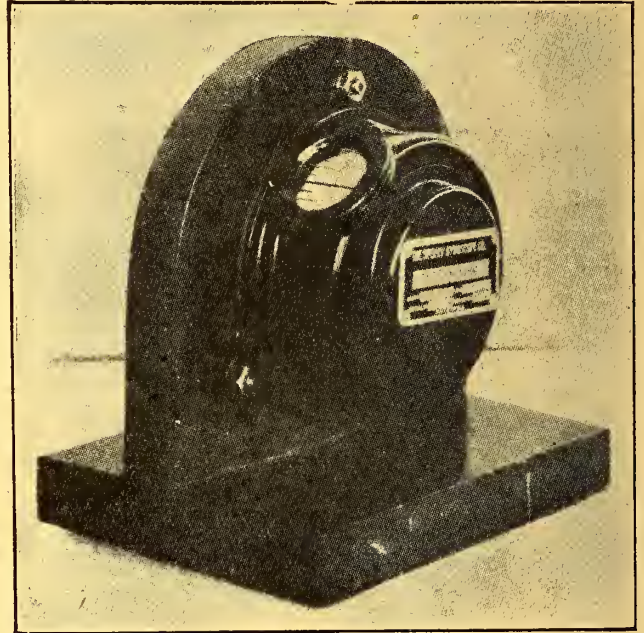
Chief interest in the motor exhibits centred around the Wisconsin, Duesenberg and Knox motors, all of which have been described in THE AEROPLANE. The Wisconsin 12 (275-h.p.) is an especially striking exhibit; its weight is 1,100 lbs.

THE SPERRY CLINOMETER.

The Sperry Gyroscope Co. have produced an instrument whereby aviators may ascertain at any time the correct fore-and-aft position of the machine, with reference to the horizontal. The apparatus is known as the Sperry dead-beat clinometer.

The operation of this instrument is simple. Whenever the clinometer is tipped forward or backward by the motion of the aeroplane this movement is registered on a scale mounted on a wheel which is damped by floating in a liquid.

If the aeroplane tips forward, the scale moves upward indicating in degrees below the zero line the exact angle. If the machine tips backward, the scale moves downward, the exact amount which is likewise shown in degrees. The scale is painted in radium, so that it is visible at night by its own light.



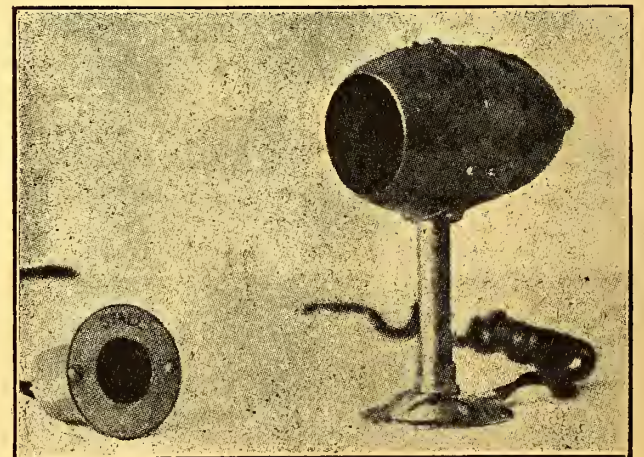
The Sperry Clinometer.

The case, measuring $4\frac{3}{8}$ ins. in over-all diameter, is made of a bronze spinning and painted black. The clinometer is usually mounted on the instrument board in the pilot's cockpit. But it may be placed elsewhere in the fuselage, providing that location is such that the instrument can be seen at all times. Though comparatively new, the Sperry clinometer has already rendered valuable and efficient service in its particular field.

THE SPERRY STALLOMETER.

The stallometer is an instrument that warns the aviator when his machine is approaching a stalling condition by indicating that the minimum air speed has been reached. It is mounted in any convenient position where the air flow is unobstructed.

The Sperry stallometer is adjustable for any desired air speed, depending on the aeroplane on which it is installed. When the pre-determined speed is reached an electric contact is made in the stallometer closing the circuit to an indicating lamp which is mounted on the instrument board.



The Sperry Stallometer.



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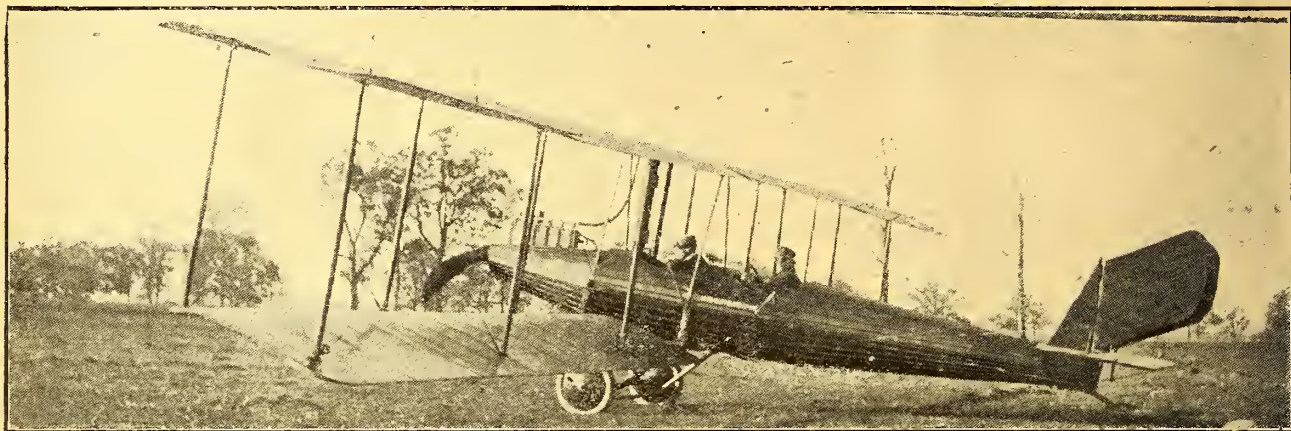
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MODERN AMERICAN AEROPLANES.



The Steel Fuselage H.17 Benoist Biplane.

The extent of the American aeroplane industry is shown by the fact that twenty-two active companies building machines in the United States to-day gave information about their products for the Exposition Number of "Aviation and Aeronautical Engineering," the famous American technical journal.

Two-place reconnaissance tractor biplanes predominated in the types of machines announced for 1917, practically all of the companies being engaged in building machines of this type or its smaller prototype, the two-seater training tractor.

Two companies specialise in building sporting-type aeroplanes. This aspect of the industry is certain to develop in the near future, as aviation is popularised.

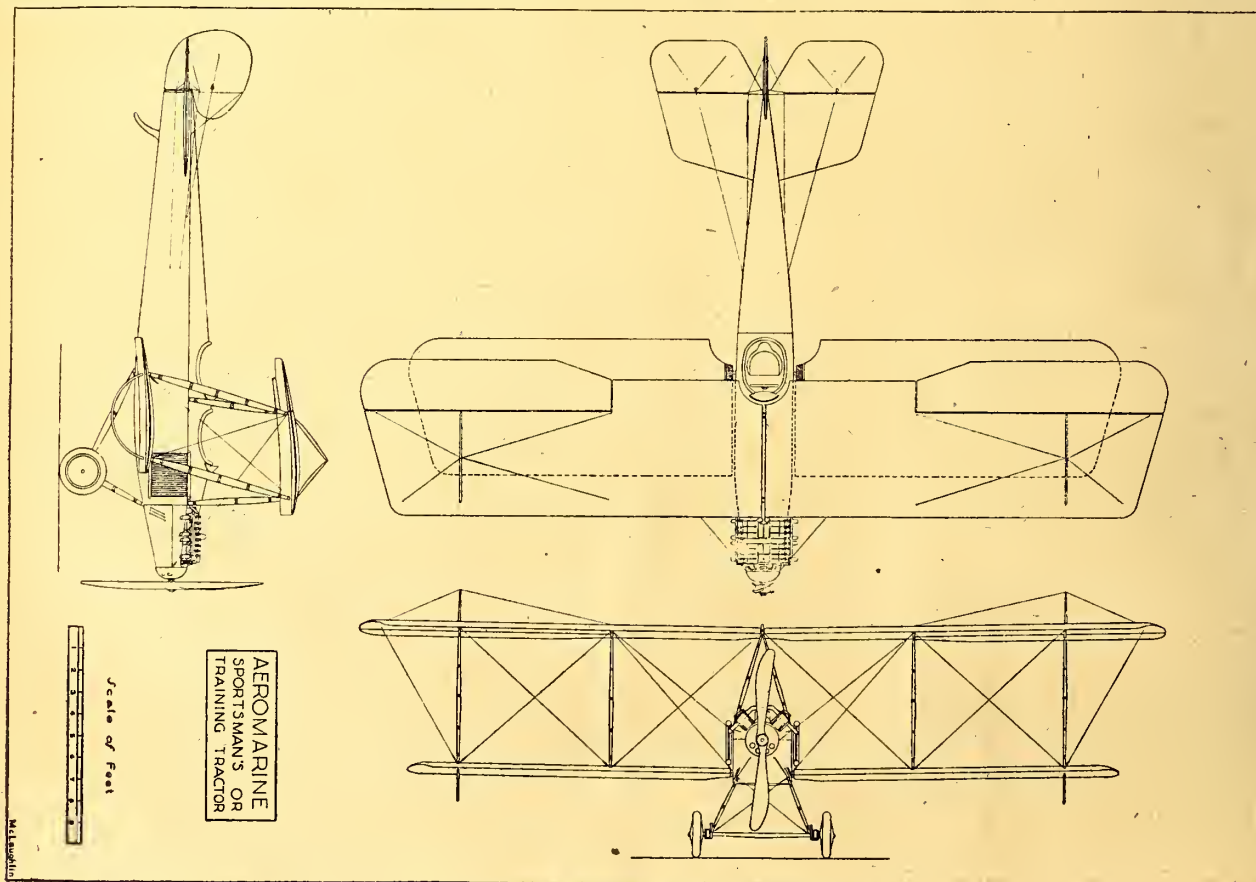
The progress of the industry in the past year has not been marked by many radical developments, but by applications of the principles of engineering. The manufacturers realise that the building of an aeroplane is just as much an engineering problem as the building of a cantilever bridge. A few machines of very radical design appear, however, and if they live up to the hopes that their constructors have for them, the progress of the industry will be even more rapid than would have seemed possible, only as short a time as one year ago.

The following particulars of the new American machines are taken, with due acknowledgments, from "Aviation" of February 1st, which has dealt with the matter in a very thorough manner.

The illustrations are chiefly taken from photographs supplied by the various firms during February and March, some time before America came into the war, so it is safe to assume that none of the information contained herein will be in any way new to the chiefs of Germany's aviation service.

The Aeromarine Plane and Motor Company.

The Aeromarine Plane and Motor Company announces a two-passenger training tractor biplane designed by Charles Willard. Liberal consideration has been made for the rough usage to which the bodies of school machines are subjected, and a high factor of safety has been employed in all wires, turnbuckles, fittings, and woodwork. A special chassis allowing easy repairs and special shock absorbers has been designed for the machine. The R.A.F.6 wing curve is used, and the leading edge of the wing is covered with thin wood to maintain a correct front curvature. Wings are covered with the best raw Irish linen



The Aero-Marine Sportsman's or Training Tractor.

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and from three to five coats of lacquer are applied to protect the linen from the weather. Fuel tanks with four hours' capacity are included in the equipment. The stabiliser is of the double cambered non-lifting type.

American Aircraft Company of Indiana.

The American Aircraft Company of Indiana, at Anderson, Indiana, manufactures a military tractor biplane, Model D, which is equipped with a 135-h.p. Sturtevant engine. In a recent trial flight the machine travelled from Anderson to Indianapolis, a distance of 40 miles, in 21 minutes, a speed of 118 miles per hour. The manufacturers claim a climb of 8,000 feet in 10 minutes. This company was incorporated January 13th, 1916, by B. J. Foster, R. B. Allison, George Feeney, John Keefe, and H. E. Cantwell. George E. Feeney is president of the company.

Atlantic Aircraft Company.

A twin-engined aeroplane using two six-cylinder vertical Aeromarine engines was designed, built, and flown last summer by Albert S. Heinrich for the Atlantic Aircraft Company. The machine, which showed excellent climbing and gliding properties, was tested at the Mineola field. The Atlantic Aircraft Company has recently dissolved.

Bates Aeroplane Company.

A new model military tractor biplane is being developed by the Bates Aeroplane Company, 104, West Oak Street, Chicago, Ill. This company is also building two more new models of aeronautical engines. It has just perfected a new propeller section, and special machinery is being installed to turn out these propellers at a very low price.

Benoist Aeroplane Company.

Four models of aeroplanes are manufactured by the Benoist Aeroplane Company, 327, South La Salle Street, Chicago, Ill., two land machines and two flying boats. The new model is the Type H-17 cross-country plane, and is a development of the different models from the designs that Tom W. Benoist has manufactured during the past four years. The chassis is of a three-wheel type, to lessen the danger of nosing over in a bad landing. A noticeable feature is the entire absence of cloth, wood, or wire in the complete body of the plane, the whole being constructed of sheet steel. The engine is a 100-h.p. 6-cylinder Roberts, turning an 8 feet 6 inches diameter by 5 feet 6 inches pitch Paragon propeller at 1,300 revolutions per minute. According to the manufacturers, 40 to 60 miles per hour was obtained with pilot, passenger, and 100 pounds of extras and 4 hours' fuel. [The firm's address is also—Sandusky, Ohio.—Ed.]

The Burgess Company.

A new Model Dunne reconnaissance aeroplane has just been completed, and [was to be] exhibited at the Pan-American Aeronautic Exposition by the Burgess Company of Marblehead, Mass. It is a development of former Dunne type aeroplanes, and embodies the features of automatic stability which have made the Dunne type planes so popular with sportsmen in the past. The engine

is of 140 horse-power. This machine is manufactured under the Dunne patents, and cannot stall, side-slip, or nose-dive. It will absolutely balance itself in flight, and with engine shut off will assume a perfect gliding angle.

Curtiss Aeroplane and Motor Corporation.

Five types of standard aeroplanes are announced for 1917, besides numerous special models which are being manufactured by the Curtiss Corporation at its factories in Buffalo and Hammondsport, N.Y. The popular JN-4B training machine is continued practically unaltered. The machine has a span on the top plane of 43 feet 7½ inches, with a chord of 5 feet, and uses the Eiffel No. 36 wing curve. The loading is 5.3 pounds per square foot of supporting surface and 21.16 pounds per brake-horse-power. Performance claimed is 75 miles an hour high speed and 43 miles per hour low speed, and a climbing speed of 3,000 feet in 10 minutes. The fuel consumption is 9 gallons per hour, and the oil consumption is 0.03 pound per hour. The propeller is 8 feet 4 inches in diameter, and has a 5-foot pitch.

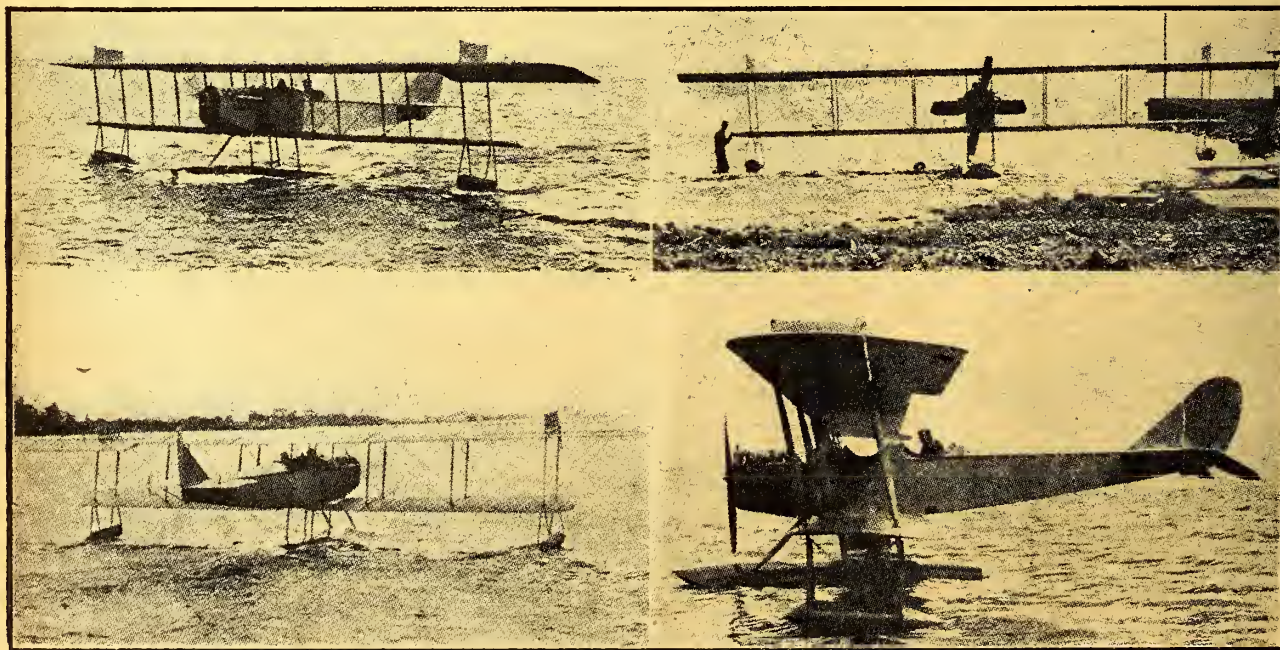
THE MODEL JN TWIN.

The Model JN-4 twin is similar to the type of machine in which Victor Carlstrom made the flight from Newport News to New York, and from New York to Washington in 1916, and which, equipped with float landing gear, he used in winning the Curtiss marine flying trophy for 1916. The wing curve is the Eiffel No. 36; the loading is 7 pounds per square foot of supporting surface and 13.75 pounds per brake horse-power. The performance claimed is a high speed of 85 miles an hour and 48 miles an hour low speed, and a climbing speed of 4,000 feet in 10 minutes. The fuel consumption is 20 gallons an hour, and the oil consumption is 0.06 pound per hour. The two OXX engines turn two 7 feet 3 inch propellers of 6 feet 2 inch pitch.

R-4 MILITARY TRACTOR

When the Mexican difficulty occurred last spring it found the United States Army practically lacking in proper aeronautical equipment for carrying on military reconnaissance, and an emergency appropriation of 500,000 dols. was passed by Congress, with which the Aviation Section of the Signal Corps went to work to build up an air squadron for General Pershing. He was supplied with 12 Model R-4 Curtiss military tractors of 160-h.p. each, and these machines proved so satisfactory that during the month of July they established a record of over 350 hours in the air and were so invaluable to General Pershing that he, a former cavalry officer, has recently been quoted as saying that in reconnaissance work "one aeroplane is worth a squadron of cavalry."

The R-4 machine uses an R.A.F. 6-wing curve and has a loading of 6.42 pounds per square foot of supporting surface and 16.21 pounds per brake horse-power. The performances claimed for this machine are 90 miles per hour high speed, 48 miles per hour low speed and a climb of 4,000 feet in 10 minutes. The engine, owing to recent improvements, is now rated at 200-h.p. instead of 160, as formerly. The fuel consumption is 20 gals. per hr. and the oil consumption is 0.038 lb. per h.p.hr.



The Model N.9 Curtiss Seaplane.

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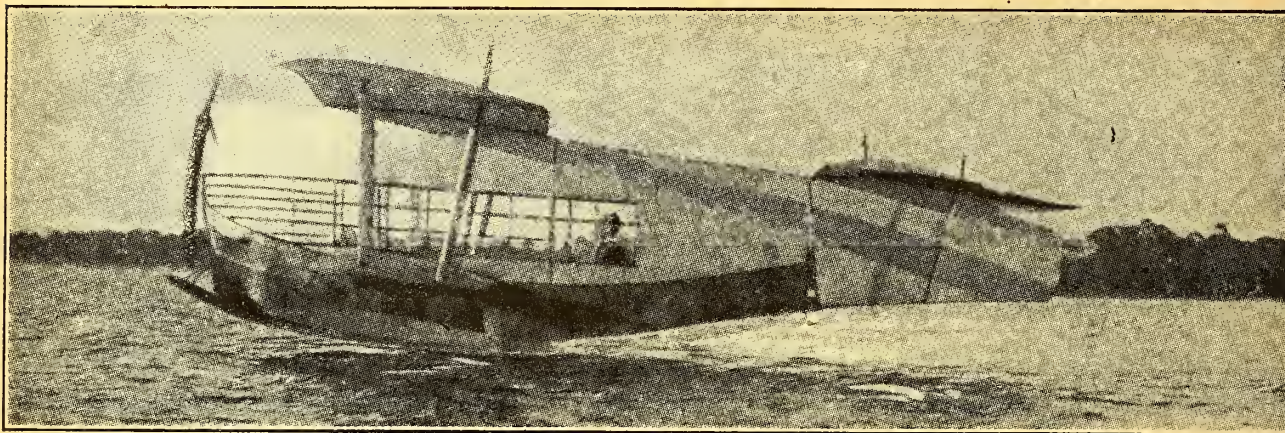
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The Lawrence-Lewis Totally Enclosed Flying Boat, with 140-h.p. Engine.

MODEL N-9.

The United States Navy recently ordered 30 Model N-9 seaplanes for training purposes. This machine is equipped with float landing gear, dimensions of floats being 15 feet 10 inches, width 4 feet $\frac{1}{2}$ -inch, depth 2 feet; main float is supplied with step. The wing curve is R.A.F.6 and the loading is 4.86 pounds per square foot of supporting surface and 25.40 pounds per brake horse-power. The performances claimed are 70 miles per hour high speed and 45 miles per hour low speed, and a climbing speed of 2,000 feet in 10 minutes. The propeller is 8 feet in diameter and 4 feet 7 inches in pitch.

MODEL F BOAT.

The familiar Curtiss Model Flying boat is continued in 1917 practically without change.

New models are being developed by the Curtiss Corporation constantly. The latest ones include a triplane speed scout of 29 feet spread and a 2-foot chord, which has made a speed of 119 miles an hour and a climb of 10,000 feet in 10 minutes. A larger triplane is also being tested at Newport News, Va. Large flying yachts to carry a useful load of over 10 tons have been designed and are in the experimental stage at the Curtiss factory. Some startling announcements are to be expected in relation to numerous different types of aeroplanes being developed by this Company in 1917.

SCHOOLS.

The Curtiss Corporation maintains flying schools at Buffalo, Hammondsport, Newport News and Miami, Fla. The schools at Newport News, Va., and Miami, Fla., have received the stamp of approval of the Aviation Section of the Signal Corps, U. S. A., for the primary training of candidates for the Officers' Reserve Corps.

De Luxe Aeros, Incorporated.

Experiment work in the development of flying boats is progressing under the direction of Harry Witts, president of the De Luxe Aeros, Incorporated, Bay Shore, L. I. The machines are to be staggered biplanes using an Eiffel wing curve. The hulls will have double concave bottoms forward of the step. An effort is being made to have these craft attractive for pleasure and sporting purposes. Deperdussin control will be used.

Kyle Smith Aircraft Company.

A two-passenger tractor biplane for sporting and training purposes is manufactured by the Kyle Smith Aircraft Company, of Wheeling, W. Va. The engine used is a 6-cylinder Radial, and the weight of the machine empty is only 600 lbs. The machine is built to carry two passengers and useful load of 600 lbs. It should appeal to sportsmen and do much to encourage aviation as a sport.

Lawrence-Lewis Aeroplane Company.

Two models of a flying boat showing great originality in design are being manufactured by the Lawrence-Lewis Aeroplane Company, People's Gas Building, Chicago, Ill. Until these machines have been completed and demonstrated before the United States Government officials the manufacturers are not anxious to give out any details concerning their construction. The machines use no ailerons, and are without lateral control, depending entirely upon aerodynamic qualities for maintaining lateral

balance. In both models, the one of 30 foot span and the other of 40 feet span, the manufacturers state that they intend to use a Hall-Scott Type A-5a, 140-h.p. 6-cylinder vertical engine.

General Aeroplane Company.

The General Aeroplane Company, of Detroit, announces three types of aeroplanes of Verville design for 1917, a boat, seaplane and a land machine, all three models using 8-cylinder V-type 100 h.p. engines. Besides building 'planes the General Aeroplane Company also conducts a school in connection with its factory in Detroit.

Lanzius Aircraft Company.

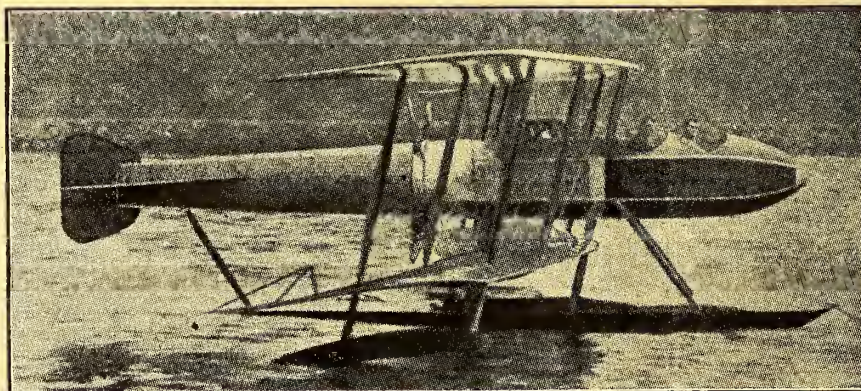
A changeable angle of incidence machine, in which the wing incidence can be varied from 0 degree to 15 degrees, is being manufactured by the Lanzius Aircraft Company, of 149, Broadway, New York, in two models, one of 38 feet span and the other of 28 feet span. The ailerons on these machines are also built under the Lanzius patent, and in many other details this machine has originality of construction. The machines can be fitted with either wheels or float landing gears for land or water use. It is the intention of the manufacturer to use 140-h.p. Duesenberg engines.

L. W. F. Engineering Company.

A two-place reconnaissance tractor biplane fitted with 140-h.p. Thomas engine is being manufactured by the L. W. F. Engineering Company of College Point, L.I. The officers of the company state that they have decided that it is best not to give any information at all about their plane, as they are doing strictly Government work, and have business in sight to last for a year, and could not take another order if they tried to. In recent official tests at Hempstead Plains the machine, with pilot, passenger, and full load, made a high speed of 93.8 miles per hour and low speed of 45 miles per hour.

New York Aero Construction Company.

The New York Aero Construction Company is developing two models of tractor biplanes at its factory, 216, High Street, Newark, N.J., from designs of Warren S. Eaton. The machines are practically identical, except that one has a two-float landing gear and the other a four-wheel landing gear. They are twin-engined, using two 100-h.p. engines of 6 cylinder vertical type. The great span of these machines, 73 ft., makes them particularly noticeable. Although the aeroplanes, fully loaded, will weigh 4,522 lbs., they have 820 ft. of supporting surface, so that the wing loading will be less than $5\frac{1}{2}$ lbs. per sq. ft.



The Gallaudet biplane, with propeller centre revolving round the fuselage. (Not described in detail.)

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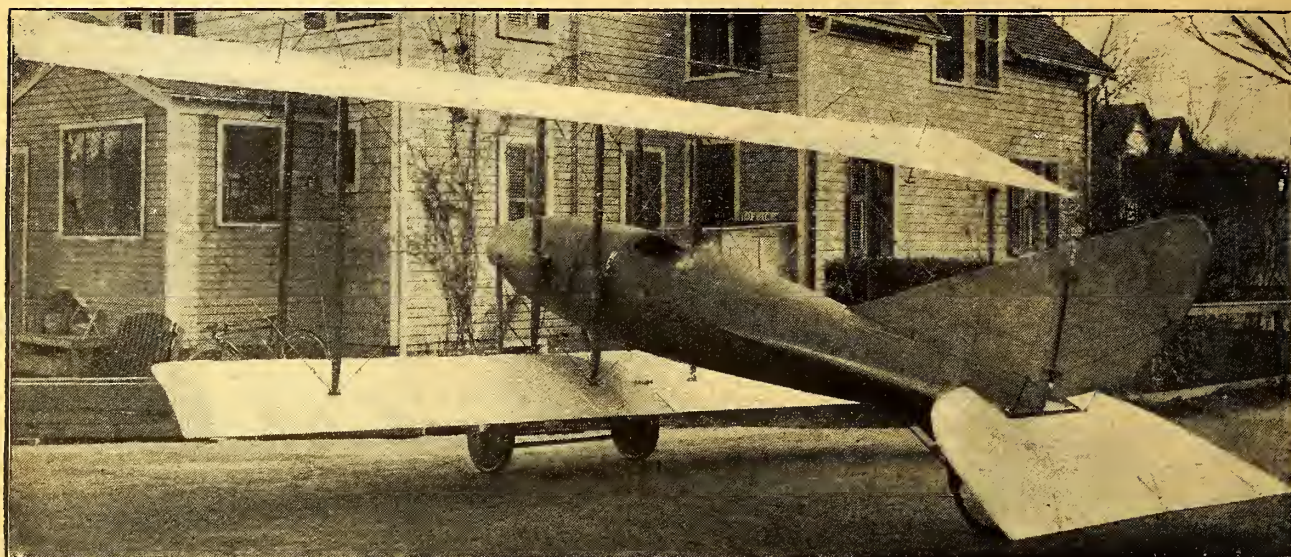
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The S. S. Pierce Aeroplane Company's Sporting Biplane.

Pacific Aero Products Company.

Conservative development of aeroplanes along standard lines is being undertaken by the Pacific Aero Products Company, whose president is W. E. Boeing, of Seattle, Washington. The model which is announced to the public is a two-float triplane with 125-h.p. Hall-Scott engine and 52 ft. span. Other models, it is understood, will be announced by this company shortly.

S. S. Pierce Aeroplane Company.

An aeroplane for sportsmen is manufactured at Southampton, L.I., by the S. S. Pierce Aeroplane Company. This machine, which embodies many ideas of foreign practice, is equipped with a 40-h.p. 3-cylinder fixed radial air-cooled engine, designed by Charles L. Lawrence. Ordinary gasoline and ordinary motor-car lubricating oil are used. The body is of the monocoque type, which, while slightly heavier than the linen body, is far more efficient aerodynamically, so that the horse-power required is greatly reduced. The wing section is peculiarly adapted to slow speed work, and the high gap ratio makes for great efficiency. The landing chassis is of the conventional type. All control surfaces are extra large. The machine, which is a single seater, is inexpensive, due to its small size and proportionately small horse-power. Owing to its slow speed, 35 to 50 miles per hour, strongly constructed body, and the distance of the pilot's seat behind the engine, the operator is unusually immune to injury in case of bad landings or other smash-ups. The machine was designed by S. S. Pierce, who was for many years instructor in the Blériot School near Paris.

Standard Aero Corporation.

Four models of the Standard Aero Corporation aeroplanes are

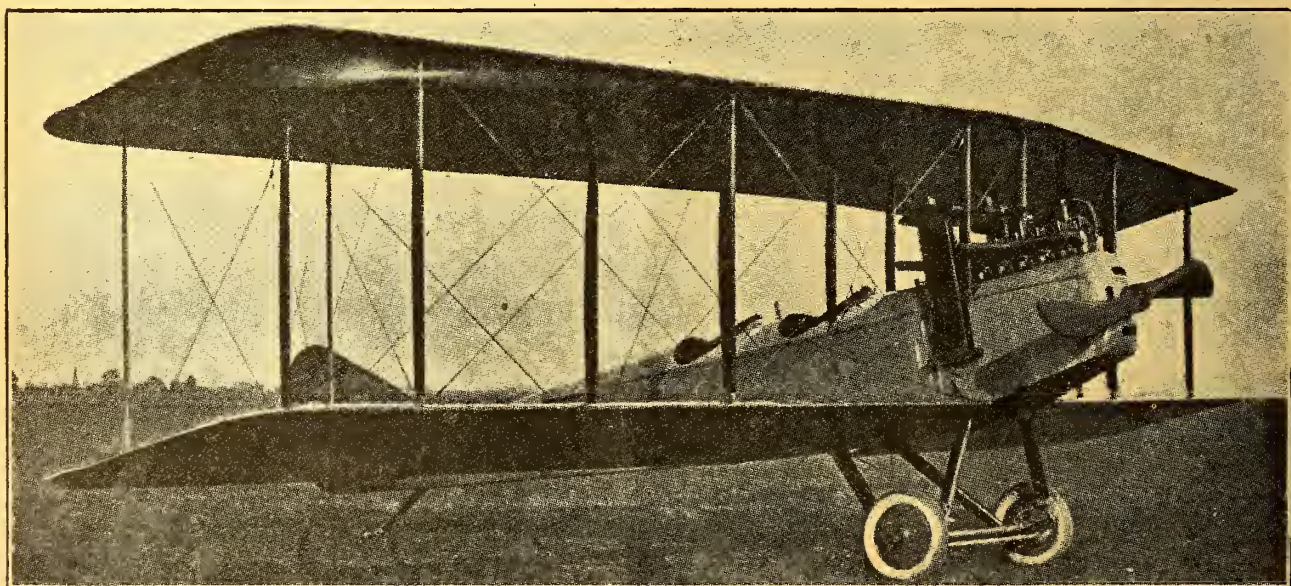
announced for 1917. These are from designs by Mr. Charles Day, and include three land machines and a seaplane.

The standard model H-3 is continued as in 1916.

The model J is a primary training machine using the R.A.F.3 wing curve with a dihedral of 3 deg. and a sweep-back of 5 deg. Special attention has been given to the factor of safety. The landing gear is of the three-wheel type with a small wheel in front to prevent nosing over in bad landings. The specifications for the twin-engined military seaplane which is being built in large quantities by the Standard Company, appear in the table of American aeroplanes for 1917. Noticeable points about the machine are the two model A-5a Hall-Scott 140-h.p. engines and the weight, which, when the machine is fully loaded, exceeds 2 tons, about 1,400 lbs. being the useful load. The Standard Company is also building a speed scout of 26 ft. 6 in. spread with a model A-5 125-h.p. Hall-Scott engine.

Sturtevant Aeroplane Company.

In addition to its 1916 model, the Sturtevant Aeroplane Company announces its model S-4 all-steel seaplane. This machine has a steel body, ailerons, rudder, elevator, stabiliser, and struts and steel wing spars. The use of steel construction has permitted the standardisation in the construction of Sturtevant planes. The speed range which is claimed for this machine is from 40 to 73 miles per hour and a climb of 4,000 ft. in 12 min. It is built from designs of Grover C. Loening. Numerous other makes of machines also from Mr. Loening's design will be announced during the course of the year. A biplane pursuit machine is expected to be among the most interesting of the new types.



The Standard Aero Corporation's Model H.3. Tractor.

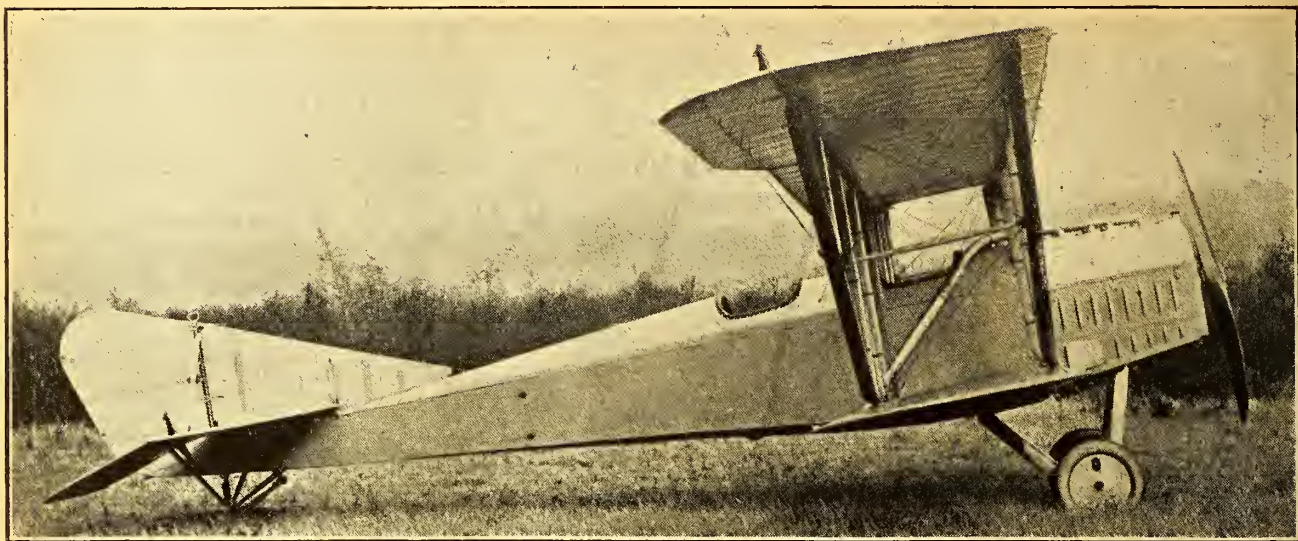
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The Thomas-Morse D 5 Reconnaissance Biplane.

Thomas-Morse Aircraft Corporation.

Several recent changes in the Thomas D-5 reconnaissance machine, which is being built for the United States Army, have been announced in the past few days. The original D-5 had a double overhang, but this has been changed to a single bay overhang. The exhaust now passes over the top plane instead of along the sides of the fuselage as formerly, and various minor changes have also been made, as shown in the accompanying photograph. The Thomas-Morse Corporation, whose factory is at Ithaca, N.Y., is also manufacturing twin-engined machines and other types for both the United States Army and Navy, and announcements of several military and naval type aeroplanes are expected for 1917.

United Eastern Aeroplane Corporation.

The United Eastern Aeroplane Corporation, of 1251, De Kalb Avenue, Brooklyn, announces three types of aeroplanes for 1917, two land machines and one seaplane. All three types are tractor biplanes of conventional design. The factor of safety of 10 is claimed for all parts of all three models. The wing curve used is Eiffel No. 36. The company has recently increased its capital from 50,000 dols. to 1,000,000 dols., and expects to increase its facilities for the manufacture of flying machines very rapidly. The Eastern School of Aviation is owned by this company. Frederick C. Hild, who is also treasurer of the company, is in charge of the aviation school. A small number of Blériot type monoplanes of very high speed will also probably be built by the company in 1917.

Wittmann-Lewis Aircraft Company, Inc.

The Wittmann-Lewis Aircraft Company, Inc., of Newark, N.J., is the successor of the Wittmann Brothers, of Stapleton, Staten Island, New York. The company has recently removed to a new plant at Newark on the Lincoln Highway where it crosses the Passaic River, where they have both land and water facilities for testing their machines. The new factory contains approximately 16,000 ft. of floor space and is being thoroughly equipped with modern labour-saving machinery.

The officers of the company are Charles R. Wittmann, president; Samuel C. Lewis, vice-president; and Paul W. Wittmann, secretary. The Wittmann brothers have been actively engaged in designing and manufacturing and flying aircraft since 1906. Their earlier experiments were contemporaneous with the Wrights. Vice-president Samuel C. Lewis has for an extended period been employed by the French Government as a civilian instructor for officers of the French Flying Corps. He has recently returned to this country.

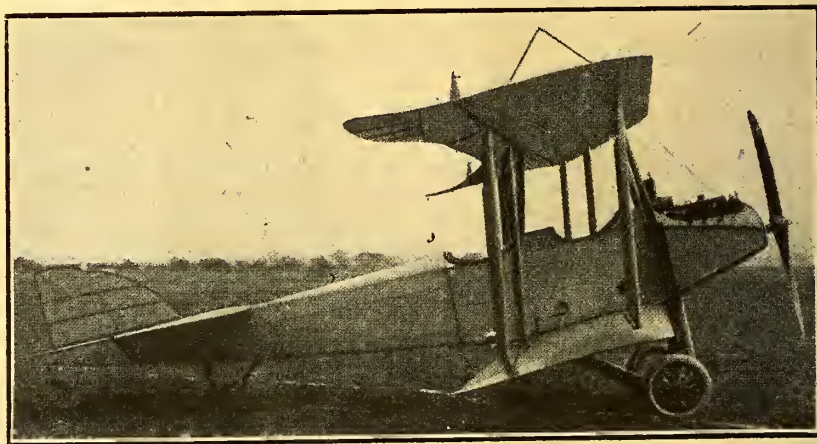
The Wittmann-Lewis Company are now building 2-place reconnaissance tractors, embodying the latest conventions of foreign prac-

tice, one of which they [were to] exhibit at the Aeronautical Exposition.

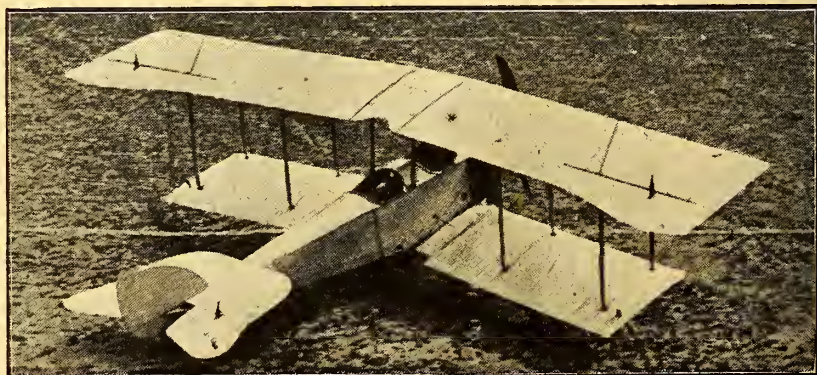
They are doing experimental work on a large following plane type aeroplane which they expect to develop. This is said to be the first practical attempt to so dispose tandem or following planes to avoid reduction of their efficiency by the upward curve of the turbulent current set up by the preceding plane. The manufacturers assert the novel design shows a concrete and well defined effort to obtain an aeroplane of great weight-carrying capacity, within good engineering limits, and adheres to principles of engineering construction, elements of design and formulae.

Wright-Martin Aircraft Corporation.

The new Wright-Martin aeroplane known as the model V [was] announced for the first time in connection with the Pan-American Aeronautic Exposition. It is a two-place reconnaissance tractor



Side View of the Eastern Military Tractor.



View from above of the Eastern Military Tractor.

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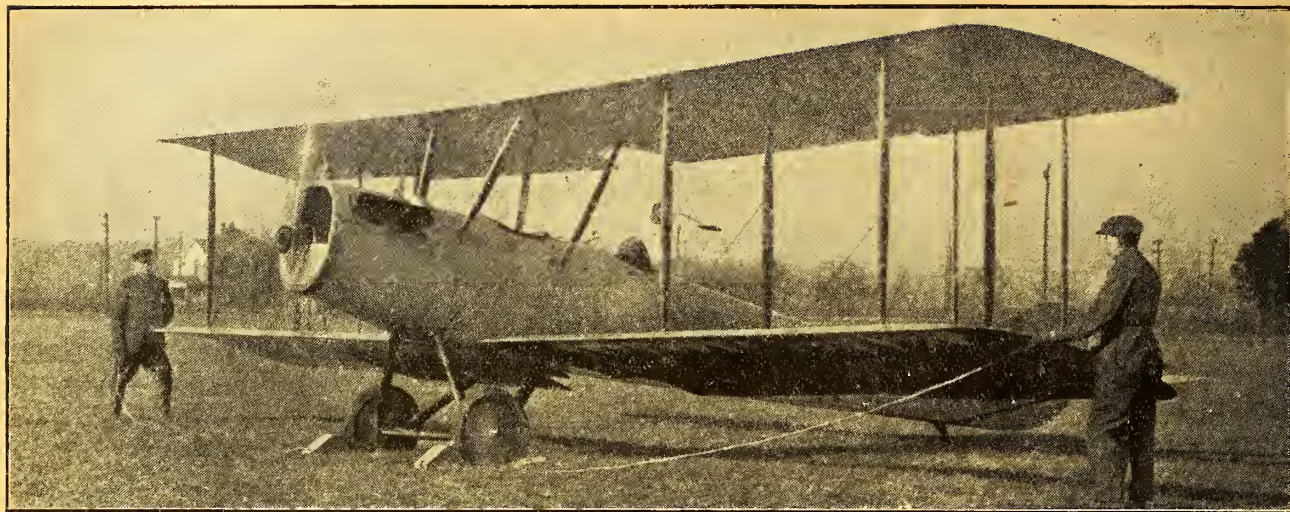
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The Wright-Martin Model V. Reconnaissance Tractor.

biplane designed for long-range work. The power plant consists of a Simplex model A Hispano-Suiza 8-cylinder engine. The wings have a spread of 39 ft. 8½ in.; they will be staggered, and have a slight dihedral angle. The wing curve is the Vought No. 4. It is claimed to have wide speed range and minimum motion of the centre of pressure. The wing curve permits very substantial construction. Four large ailerons are hinged to the trailing edges of the wings.

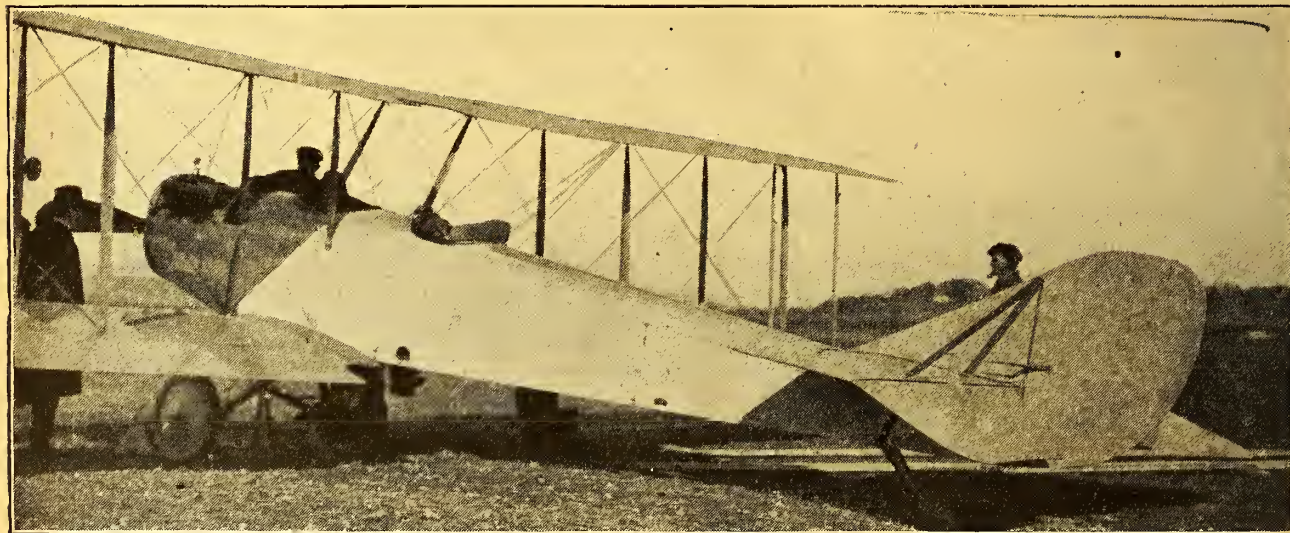
The body is of the two-place one-piece type, flat sided and fully enclosed. The nose containing the power plant is detachable, and this is one of the special features of the machine. The fuel tanks are placed behind the passenger's seat, well removed from the engine to minimise fire risk. The body is constructed of ash and spruce, braced with Roebling vanadium steel wire and Wright-Martin turnbuckles. The rear cockpit is fitted with Deperdussin control and the instruments are arranged in accordance with Government requirements on the instrument board. The chassis of the two-wheel type of special design minimises head resistance and is made of ash.

The axles are nickel steel tubing specially heat treated and

the design of the landing chassis is such that repairs to the axles can be made without affecting the adjustment of the shock absorbers. About ten yards of cotton encased rubber cord is used on each shock absorber. The wheels are held in position by hexagonal hub caps and wheel thread, 5 feet 3½ inches, is very broad. The control areas are operated through double control cables passing over pressed steel pulleys of very novel design. The loading per square foot is 5.86 pounds and the loading per brake horse-power 16.86 pounds. The Hispano-Suiza engine turns an 8 feet 4 inches in diameter by 5 feet 7½ inches pitch propeller at 1,450 revolutions per minute.

The Martin model R, the reconnaissance tractor, is continued for 1917 with 140-h.p. Hall-Scott engine.

One of the features of the Wright-Martin Aircraft Corporation exhibit at the Pan-American Aeronautic Exhibition [was] expected to be the original Wright flier of 1903, the first power-driven aeroplane in the world to fly. In this machine on Dec. 17th, 1903, Wilbur and Orville Wright each made two flights. Orville Wright made the first flight and Wilbur the longest flight. The power developed by the engine in these first flights was 12-h.p.



Three-Quarter Rear View of the Model V. Wright-Martin.

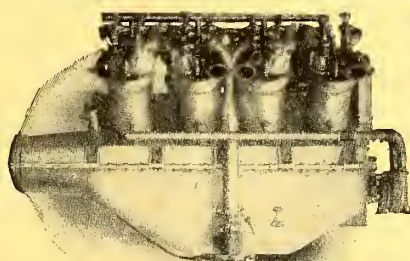
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AMERICAN AERO-ENGINES OF TO-DAY.

Perhaps the chief characteristic in aeroplane engine development in the last few months has been the increased use of aluminium, in order to reduce the weight of the engines per horse-power.

The new Sturtevant 5-A, 8-cylinder, 140-h.p., valve in the head, engine weighs 514 pounds against 580 pounds for the model 5, which develops the same horse-power. This is a reduction in weight of 66 pounds, so that the new engine weighs about 3.6 pounds to the horse-power.

The new Thomas model 88 develops 150-h.p. and weighs only 525 pounds, equipped with a self-starter, 105 pounds less than the 135-h.p. model 8 engine, so that the new engine weighs but $3\frac{1}{2}$ pounds to the horse-power.

The new Hall-Scott A-5a, 140-h.p., 6-cylinder vertical engine weighs 10 pounds less than its prototype, the A-5, 125-h.p.

An interesting development has been the number of engines of very large horse-power which are either ready for the market now or are in course of construction.

The Curtiss 12-cylinder 250-h.p. engine, the Duesenberg 250-h.p. engine, the General Ordnance Company, 250-h.p. engine, the 12-cylinder Packard engine, the 12-cylinder Sturtevant engine and the 300-h.p. engine which is being completed by the Knox Motor Company, should be put on the market inside of twelve months.

If one were to predict the engine development for 1917 he might guess that in another year engines from 75 to 110-h.p. which weighed between 200 and 300 pounds and engines of 300-h.p. which weighed about 900 pounds would probably be announced, while even larger horse-powers are to be expected. The development of large horse-powers should result in a reduction of weight per horse-power.

The Aeromarine Plane and Motor Company.

The Aeromarine Plane and Motor Company announces two types of engines for aeroplanes for 1917, a 6-cylinder 85-h.p. and a 12-cylinder type. The 6-cylinder is practically a continuation of the vertical engine of former years. The 12-cylinder is a new engine, built from new designs, and according to the manufacturers, will deliver 150-h.p. The crankshaft is of the 7-bearing type, the connecting rods are of the fork type made of chrome nickel steel, the valves are concentric, the inlet valve working inside the exhaust and both valves being set practically in the centre of the cylinder head. The crank case is 92 per cent. aluminium and 8 per cent. copper. Oil is delivered to the main bearings and every part of the engine by forced feed. The design of this engine prevents overheating of the cylinders when flying upside down, or "looping the loop." Ignition is supplied by two 12-cylinder Dixie magnetos. Water cooling is used and a thermostat regulates the temperature. Two Zenith carburettors are employed. The weight of the engine complete is approximately 750 pounds.

The Curtiss Aeroplane and Motor Corporation.

No new types of engines for 1917 are announced by the Curtiss Corporation. Refinement and improvements on the standard engines are being made as experience dictates. The three types for 1917 are the OX, OXX and V2. All three are 8-cylinder V, 4-stroke cycle engines.

The OX is rated 90-h.p., 1,400 revolutions per minute, and the cylinder dimensions are 4 inches bore and 5 inches stroke.

The OXX, which is rated 100-h.p., has one-quarter inch larger bore. Ignition is supplied by a single spark, 8-cylinder high tension magneto, carburation is from duplex Zenith, and the lubrication is pressure feed with a gravity return to a splash pan and oil reservoir. The oil pressure is from 40 to 60 pounds at 1,400 revolutions per minute, water circulation by a centrifugal pump is used to cool the engine, and poppet valves in the head are employed. Chrome vanadium steel, "H" section connecting rods are used, and the rod bearings are brass backed and babbitt lined. The engine has a five bearing chrome nickel steel crank-shaft.

Recent changes in the VX engine of former years have raised its rated horse-power from 160 to 200, and it is now called the V2. No radical departures have been made, but mechanical alterations and improvements have increased the efficiency. Double ignition and two Zenith carburettors are used. The general design follows the lines of the OX and the OXX, except that the size is greatly increased. While the rated horse-power is 200, a maximum of 220 is obtained at 1,650 revolutions per minute. The torque at 1,400 revolutions is 1,000 pounds, and at 1,650 revolutions 1,100 pounds.

The Brooke Multi-X.

Thomas Preston Brooke, of Chicago, has produced an aeroplane engine, which owing to foreign patent applications pending, cannot be described in detail. It is a 6-cylinder rotary engine, the cylinders being $3\frac{1}{2}$ by 4 inches. According to the manufacturer, the engine has developed 78-h.p. It is designed so that there is practically no gyroscopic effect in the revolving motor and propeller. It is asserted that this engine has a perfect 4-cycle action, although it produces an explosion in each cylinder at each revolution. In the tests, an 8-foot diameter, of 6-foot pitch, 3-blade Paragon propeller was used.

Dayton Aero Motor Company.

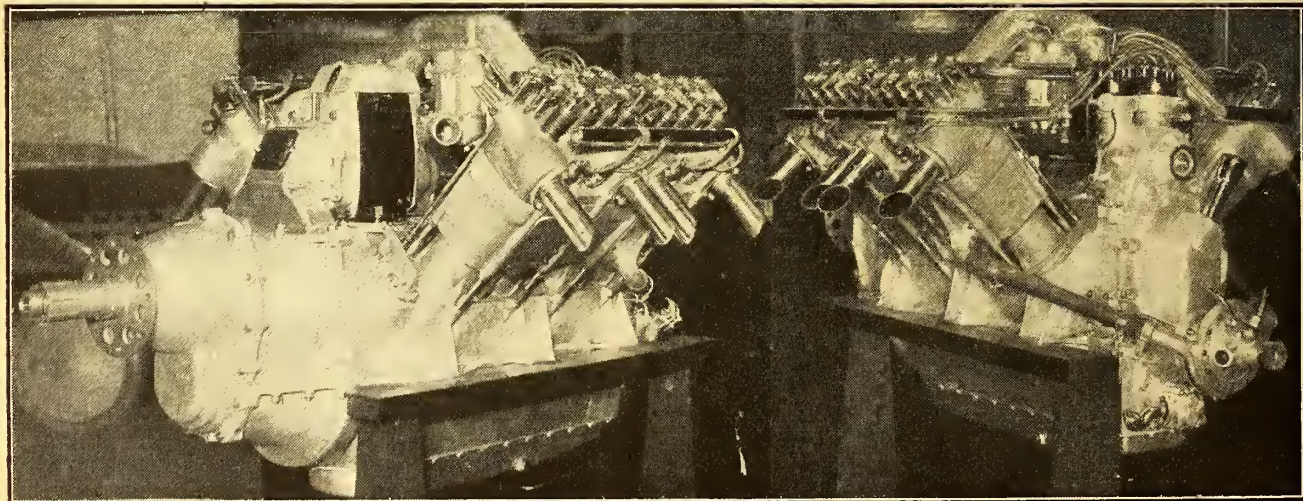
No change is announced in the specifications of the Rausenberger engine for 1917, but the Dayton Aero Motor Company, of Dayton, Ohio, which has developed the engine, announces that it has sold its interests in the manufacture of the Rausenberger motor. At the present time it is impossible to make an announcement of the purchaser, but it is expected that the manufacture of the Rausenberger engine will go forward in 1917.

Duesenberg Motor Company.

A 12-cylinder aeroplane engine with a bore of $4\frac{1}{2}$ in., and a stroke of 7 in., which will deliver about 300 h.p., is announced by the Duesenberg Motor Company, of St. Paul, Minn. Many years of experience in the building of high-class gasoline engines for motor boats has fitted the Duesenberg Company to produce engines for aircraft. Months of experiment with this new aircraft engine have refined it to a point where its reliability should be ensured. No details of the construction of the engine beyond those that appear in the illustration are available. A 4-cylinder aero engine is also built by the Duesenberg Motor Company, and a 12-cylinder engine of even larger horse-power than the one announced above is being developed.

General Ordnance Company.

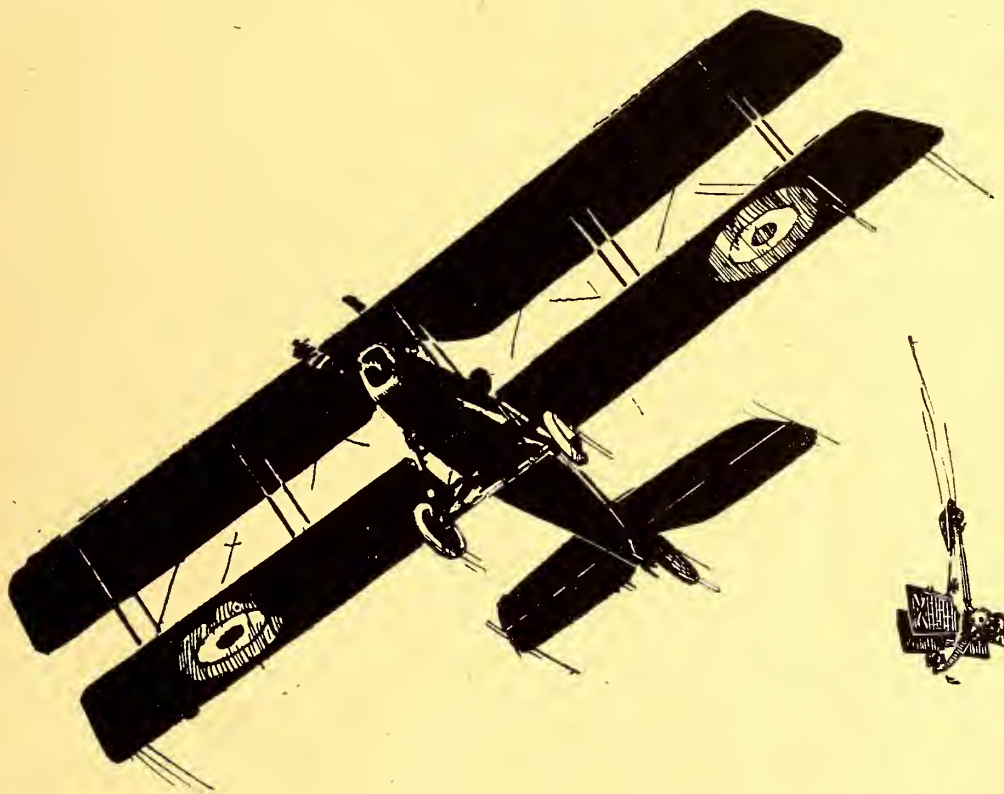
A new 8-cylinder engine, the counterpart of one built in France before the war, and which developed 199 h.p. at 1,450



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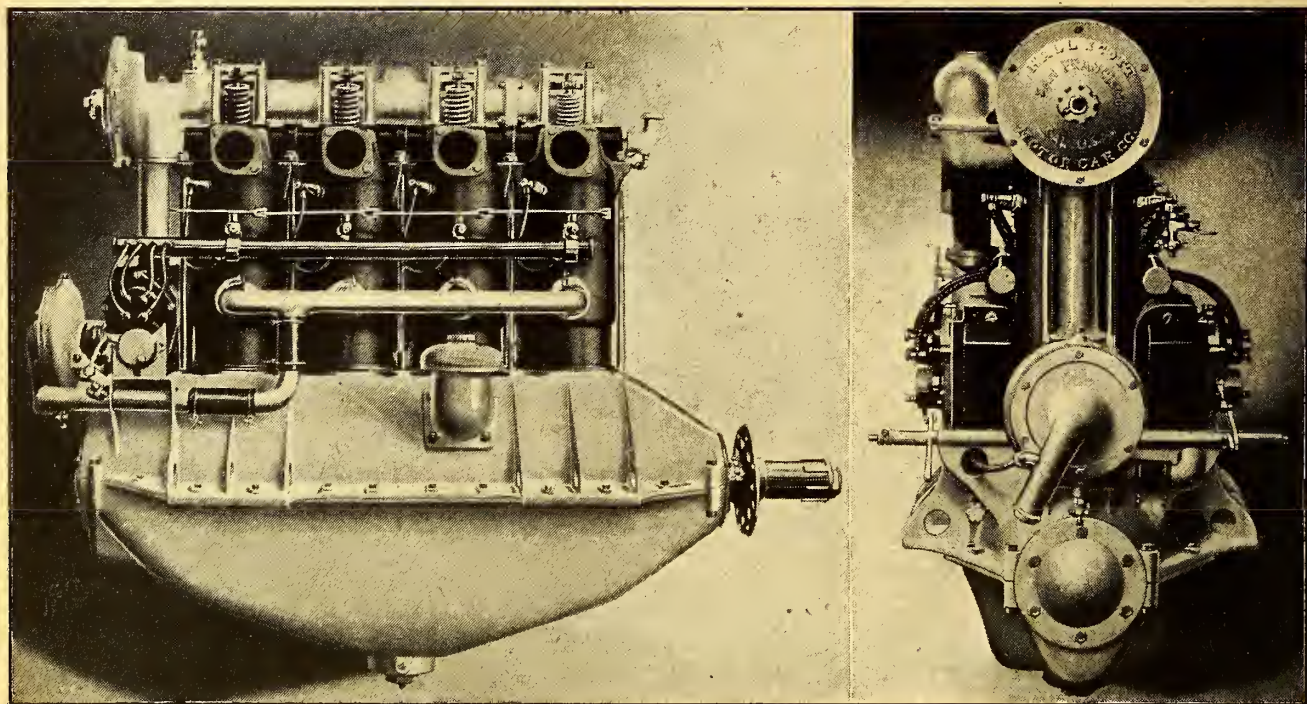
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The Type A-7a. 100-h.p. Hall-Scott Engine.

r.p.m., has just been announced by the General Ordnance Company, of Derby, Conn., from designs by Charles L. Lawrence and Francis Moulton.

The new engine, which weighs only 876 lbs., is expected to develop 230 h.p. at 1,800 r.p.m. It is a V type, water-cooled engine with cylinders set at 90 deg. The bore is $4\frac{3}{4}$ in., stroke $6\frac{1}{2}$ in., and piston displacement 920 cubic in. The connecting rods are of I section; each rod on an opposite pair of cylinders bears on one crank pin, one rod of each pair being forked. The peculiar feature of the engine is that no bushings are used for the piston pins. The material of the pistons is used for bearing surfaces, the piston pins being clamped in the connecting rods. Another novel feature is the over-run exhaust ports at the bottom of the stroke controlled by a rotary valve turning at one-quarter engine speed. Lubrication is by forced feed under a pressure of between 50 and 100 lbs. A reduction gear is used for driving the propeller, the gear ratio to be determined by the needs of the individual user, the standard reduction being 2 to 1. Water circulation for cooling is by a centrifugal pump. Two Dixie 8-cylinder magnetos are used, driven from a spiral gear on the crankshaft through spiral gears on the magneto shaft, each magneto firing the entire engine.

The General Vehicle Company.

Rotary Gnome engines are being built to foreign specifications by the General Vehicle Company at Long Island City, L.I. Recently the company has received permission to sell these engines in the United States. No details of the engine, other than those stated in the table of aeroplane engines printed in this issue, are available, but it may be stated that reports from abroad indicate that the American-made Gnome is giving complete satisfaction in military operations.

Gyro Motor Company.

Rotary aeroplane engines of American design and construction are being built by the Gyro Motor Company, 774, Girard Street, Washington, D.C., in two models, "K" and "L." The "K" model is a 90-h.p., and the "L" is 110-h.p. Practically no change in the construction of these engines has been made during the past year. Model "K" is a 7-cylinder engine, and weighs 215 lbs., and the claimed gasoline consumption is 8 U.S. gallons per hour, while model "L" is a 9-cylinder engine with a gasoline consumption of 10 gallons per hour. Both are lubricated with castor oil, and air-cooled. The bore of both is $4\frac{1}{2}$ in., stroke 6 in. The speed of the "K" is 1,250

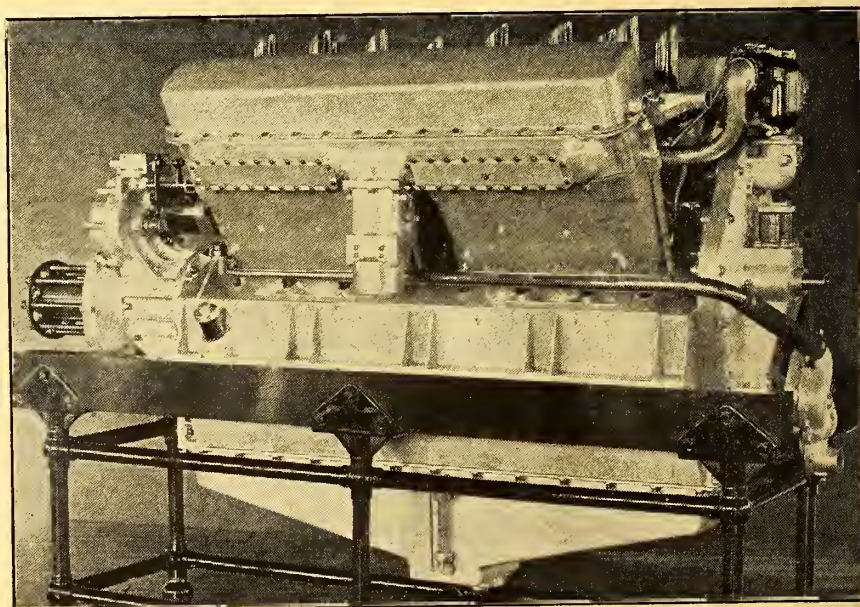
revolutions, for the "L" 1,200 r.p.m., at which speeds they are said to develop the rated horse-power.

Hall-Scott Motor Car Company.

Two new types of aeroplane engines have recently been announced by the Hall-Scott Motor Car Company of Berkeley, Cal., the type A-5a, 6-cylinder 140-h.p., and type A-7a, 4-cylinder 100-h.p. The new types are practically similar in design to the well-known types A-5 and A-7 respectively, except that whereas the older types had cylinders of 5 in. bore by 7 in. stroke, the new engines have $5\frac{1}{4}$ in. bore while the stroke remains the same.

The principles of the standard Hall-Scott types are so well known in the American aeronautical industry that descriptions of the new engines are almost unnecessary. The simplicity, accessibility and sturdiness of these engines are well known, and the claims of the company that the 4- and 6-cylinder models of gasoline engines are better fitted for aeronautical work than 8- and 12-cylinder engines of equal horse-power, because they can be built more sturdily, are also familiar to everyone connected with American aeronautics.

In all four types fully water-jacketed cylinders are cast separately. The connecting rods are of I-beam cross-section,



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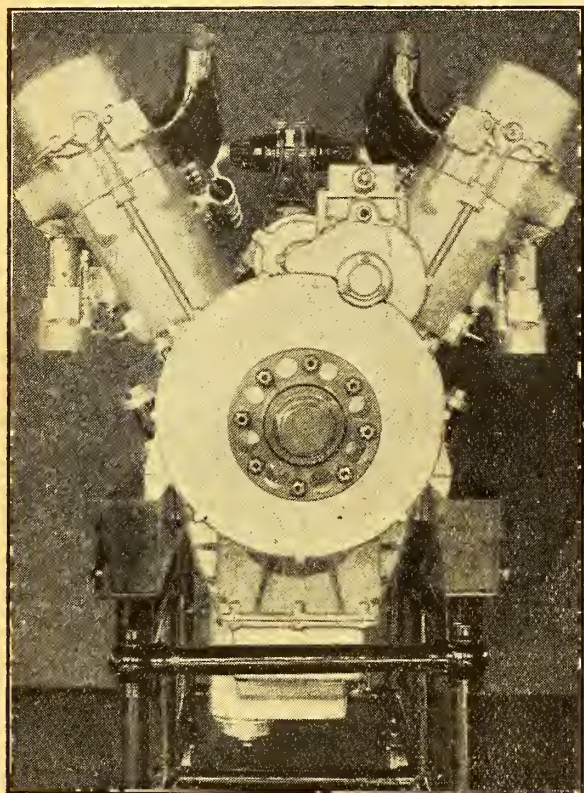
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Propeller End of the Knox Engine.

milled from solid chrome nickel steel. Zenith carburation is provided. Self-starters can easily be fitted to Hall-Scott engines, and these engines have given satisfactory results when used in testing self-starters. Two waterproofed Dixie magnetos fire the gasoline charges, each cylinder being fired by two sets of spark plugs. Water circulation is used for cooling purposes. Extremely large overhead valves, located in the head and operated by rocker-arms, are designed to give quick opening and to allow the gases to enter and exhaust with minimum interference.

Through refinements in design it is provided that the weight of the A-5a and A-5 and the weight of the A-7a and the A-7 engines are practically equal, though the A-5a is rated at 140 h.p. as against 125 for the A-5, and the A-7a is rated at 100 h.p. as against 90 for the A-7.

The Hall-Scott factory is turning out 15 engines a day on contracts for the United States Army and Navy and for foreign Governments.

The power curves of the four types of engines show that at 1,375 r.p.m., the normal propeller speed, all of the models exceed their rated horse-power.

Kemp Machine Works.

Four types of aeroplane engines—all of them air-cooled—are offered to the public by the Kemp Machine Works, Muncie, Ind. These engines are rated at 16, 35, 55, and 80 h.p. The 16-h.p. model has two cylinders, the 35-h.p. model four, the 55-h.p. six, and the 80-h.p. eight. The construction of the 8-cylinder 80-h.p. air-cooled aeroplane engine is especially interesting. It is claimed that the adoption of air-cooling is lighter than the usual water-cooling for aeroplane engines of the fixed V type. Also the radiator is done away with, and in this way head resistance is saved. In faster aeroplanes head resistance is an all-important factor, as the pressure per sq. ft. is 12.3 lbs. at 50 miles per hour, 27.7 lbs. at 75 m.p.h., and 49.2 lbs. at 100 m.p.h. The radiator of a water-cooled engine must be placed in a position exposed to the air, and is generally in the slipstream of the propeller, which increases the resistance from 15 to 25 per cent. The saving is not only one of weight, but is more than equally important in head resistance.

The engine is cooled by a positive forced draught cooling system, in which the fan is mounted direct on the crankshaft and discharges the air direct into the two manifolds leading to the cylinder jackets.

The cylinders of all the makes of engines are $4\frac{1}{2}$ by $4\frac{1}{2}$ in., except the 8-cylinder model, which is $4\frac{1}{2}$ by $4\frac{3}{4}$ in. It develops its rated horse-power at 1,150 r.p.m. The weight, completely equipped, is 380 lbs.

Knox Machine Works.

A heavy duty 300-h.p. 12-cylinder engine for aeroplanes is offered to the public for 1917 by the Knox Motors Company of Springfield, Mass. The engine has been developed from the designs and under the personal direction of Frank Trego. It is extremely substantial, and is the result of thorough tests and careful engineering design. Some of its notable features are that it is supported in the body on a shelf running the full length of the case instead of the usual supporting legs. The twelve cylinders are cast three to a block, and the cylinder heads are cast in blocks of six. The crankshaft is a chrome-nickel forging drilled for pressure lubrication, and is of the three-bearing type. The oil pump hangs from the upper half of the crank case, a patented feature, so there are no tight connections between the pump and the engine. Ignition for starting is furnished by battery, and for running by a generator, making at all times a dual source of crank supply. Double Zenith carburetors are used.

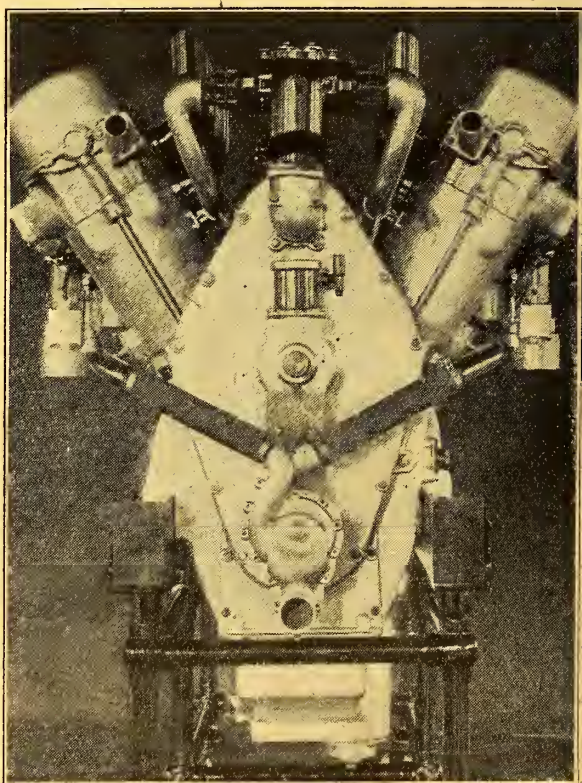
Maximotor Company.

No changes are announced in the products of the Maximotor Company, 1546, East Jefferson Avenue, Detroit, Mich. The three models—A-6, B-6, and A-8—will be continued as in previous years. The A-6 engine is an 80-90-h.p. at 1,600 r.p.m., with six $4\frac{1}{2}$ by 6 in. cylinders. The B-6 is a 6-cylinder engine, develops from 110 to 120 h.p., and has 5 by 6 in. cylinders. The cylinders in the A-8 are $4\frac{1}{2}$ by 5 in., and from 110 to 120 h.p. is claimed at 1,600 r.p.m.

The Orlo Motor Company.

Three types of aerial engines manufactured by the Orlo Motor Company, 39, Graham Street, Rochester, N.Y., are continued in 1917 as in 1916. They include a 4-, a 6- and an 8-cylinder model of the V type. The cylinders on all models are $4\frac{1}{2}$ by 6 in. The horse-power at 1,300 r.p.m. of the 4-cylinder engine is 50, of the 6-cylinder 75, and of the 8-cylinder 100. 125 h.p. is claimed for the 8-cylinder engine at 1,400 r.p.m., and even higher engine speeds are said to be easily obtainable. The engines are of the overhead valve type, water-cooled and with dual ignition. A Schebler carburettor is used.

The cylinders in the V-type engine are not staggered, but the connecting rods are set so that one rod bears directly on the crank pin while the other oscillates upon it. Water and gas manifolds are so designed that any one cylinder can be removed without disturbing the rest of the engines. Large sized nickel steel valves with separate rocker-arms and push rods for intake and exhaust are employed, no valve cages being used. The cylinders are not fastened to the crank case, but are tied to the crankshaft itself by steel studs that extend clear through the aluminium crank case to the main bearings, which are manganese bronze, babbitt lined. The engine is equipped



Pump End of the Knox Engine.

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with a device for raising all the exhaust valves simultaneously to facilitate starting.

Packard Motor Company.

After years of successful experience in the automobile field, the Packard Motor Company, Detroit, Mich., announced last spring that it was preparing to enter the field of building engines for aviation. However, the policy of the Packard Company from its first organisation has always been to make no announcements of engines until they were ready to be placed on the market. It is therefore impossible to add any description to that contained in the table of engines for 1917.

The Sterling Engine Company.

The Sterling Engine Company of Buffalo, N.Y., manufacturers of marine engines, are building Sunbeam aeroplane engines from the original design of Louis Coatalen. These engines are being built under the formulæ, patents, and specifications of the Sunbeam Company, and the Sterling Engine Company has the sole manufacturing rights for this country.

The 320-h.p. Sterling-Sunbeam 12-cylinder aeroplane engine is at present under construction by the Sterling Engine Company. These engines have a bore of 4 5-16 in., stroke of 6 1/4 in., and are rated 320 h.p. at 2,000 r.p.m. Weight of the engine, with carburetors and ignition, but empty, is 1,100 lbs. The construction of the engine is simple, and the material used throughout is of the very best.

These engines are built to give an unusual amount of service and reliability. Crank case and oil pan are of special aero metal, strongly ribbed bearing hangers between each crank throw stiffens the crank case, making it rigid and preserving proper alignment of all parts. The crankshaft has eight main bearings. There is also an additional bearing supporting the propeller end outside of the reduction gear driving propeller shaft. This construction prevents deflection of the shaft and ensures maximum efficiency of gearing.

Pressure feed oiling system is used so that all parts, where there is friction, are thoroughly lubricated regardless of the angle of the engine. Four carburetors are used, one for each block of three cylinders. There are also four 6-cylinder magnetos.

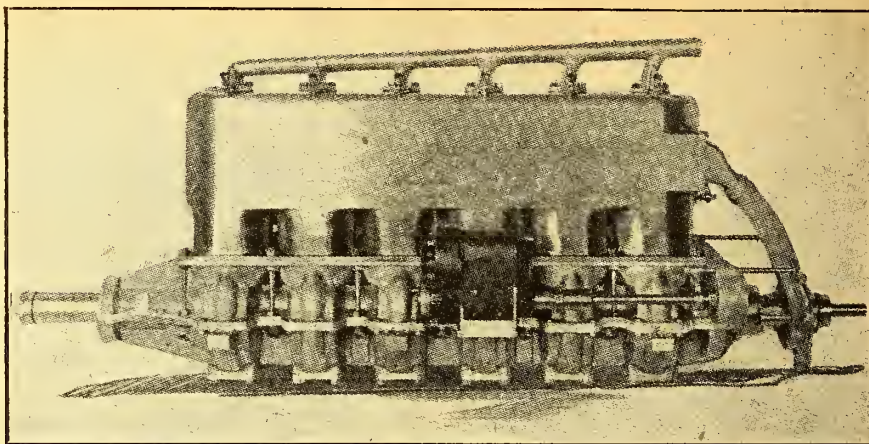
Reduction drive to propeller shaft has a two to one ratio operating propeller at 1,000 revolutions per minute with engine turning 2,000 revolutions per minute. Roller radial bearings and double thrust bearing provide ample bearing capacity for propeller load. The double thrust makes the engine suitable for both tractor and pusher type aeroplanes. Starting is either by air or geared hand starting from the side of the engine.

In addition to the engine described above, the Sterling Company will build a smaller 12-cylinder Sterling-Sunbeam engine and an 18-cylinder V-type Sterling-Sunbeam of the same cylinder dimensions as the 12-cylinder 320-h.p. engine.

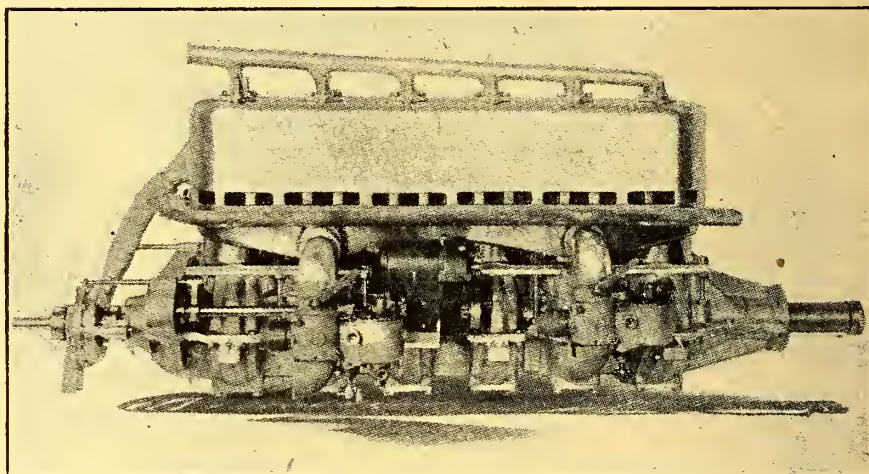
B. F. Sturtevant Company.

The latest design of aeronautical engine manufactured by the B. F. Sturtevant Company, Hyde Park, Mass., is known as model 5-A, type 8. The horse-power rating is 140 at 2,000 revolutions per minute and the weight per brake horse-power has been reduced to 3.7 pounds as a result of the use of aluminium. The new Sturtevant engine is of the valve in the head type and the valves are constructed of hard tungsten steel. The connecting rods are of the "H" section type and are made from forgings of the special chrome nickel steel, which is claimed to have a tensile strength of 200 pounds per square inch. The hollow crank shaft is 2 1/2 inches in diameter and is of the 3-bearing type.

The propeller shaft is carried on two large annular ball bearings and is driven by spur reduction gears. An important feature in this engine is illustrated by the cam shaft, as the shape of the cams has been modified in order to give a quicker opening for higher power at high speeds. Lubrication is provided by forced circulation. The carburetor is of the Zenith duplex type. The most notable departures from Standard Sturtevant practice exemplified in this engine are to be found in the use of the new type cam shaft and the use of aluminium resulting in great weight reduction.



Magneto Side of the Roberts Two-Stroke Engine.



Inlet Side of the Roberts Two-Stroke Engine.

[Made by Roberts Motor Mfg., Co., 151 Roberts Building, Sandusky, Ohio. Engine not described in detail.]

Thomas-Morse Aircraft Corporation.

Coincident with the Pan-American Aeronautic Exposition, the Thomas Company announces that it is ready to offer to the public its new aluminium engine as well as the Thomas model 8 engine of 1916. The full and complete description of the Thomas model 88 aluminium engine will appear in an early issue of "Aviation and Aeronautical Engineering." The weight of the engine, which in its general characteristics follows the design of the Thomas model 8, has been reduced 105 pounds from 630 to 525. The horse-power has been increased from 135-h.p. at 2,000 revolutions per minute in the model 8 to 150-h.p. at 2,100 revolutions in the model 88. This increase in horse-power is largely due to an increase in the bore of the engine from 4 inches to 4 1/2 inches and the use of aluminium pistons permitting higher engine speed. The installations of the Thomas model 8 is shown in the accompanying photograph.

NEW COMPANY FORMED.

Confirming rumours that have been current for the past month, it is announced that a new company, which will be known as the Thomas-Morse Aircraft Corporation, headed by Frank L. Morse, will take over the assets of both the Thomas Bros. Aeroplane Company and the Thomas Aero-motor Company. The organisations of the retiring companies will be retained under the personal direction of Mr. Morse, who is well known in engineering and manufacturing circles generally, where the Morse Rocker Joint Silent Chain is extensively used for power transmission and cam-shaft drives for automobile motors. William T. Thomas, formerly the president of the Thomas Companies, will occupy the position of Vice-President of the new company, and B. Douglas Thomas will continue as Chief Engineer in the department of aeroplane design. Jerome A. Fried, General Manager of the Aero-motor Company in the past, will act as Secretary and Treasurer. Raymond Ware, who was formerly in charge of sales of both aeroplanes and aero-engines, will continue in this capacity and also have general supervision of the advertising. The personnel of the Engine Department, which will shortly move into a new and spacious concrete steel factory, remains the same. Harold N. Bliss will be in charge of manufacturing and George H. Abel will continue as Chief Engineer.

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and have oversight of all experimental work. Much of the success that has attended the Thomas 135-h.p. aero-motor, now well known to aeroplane manufacturers, is due to these two men, who combine experience covering more than 8 years in the development of high-speed aeronautical engines. With the increased facilities offered by the new aero-motor factory, production will be materially increased.

H. L. F. Trebert Engine Works.

An aeroplane engine of novel design providing 16 air-cooled cylinders cast separately and arranged radially about the crank shaft is announced by the H. L. F. Trebert Engine Works, 495, St. Paul Street, Rochester, N. Y. The engine revolves on a stationary crank-shaft with double row annular and thrust ball bearing. No connecting rods are used. Two pistons are in one piece with a yoke in the centre having a sliding bearing which takes the place of the connecting rods and gives the same action with less weight. The gases are drawn through the end of the crank-shaft which acts as part of the manifold, as the carburettor is attached to the end of the shaft. Passing through the crank-shaft and through the web of the crank into the main manifold, the gases are then distributed into the underside of the piston, from thence through the automatic valves in the piston head into the cylinder. The ignition is a two-spark magneto running at twice engine speed. Lubrication is a continuous flow through the crank-shaft. The chief advantages claimed for the Trebert engine are freedom from vibration, lightness, durability, compactness, accessibility, simplicity and almost complete absence of gyroscopic action.

Wisconsin Motor Manufacturing Company.

Two models of aviation engines are announced for 1917 by the Wisconsin Motor Manufacturing Company, Milwaukee, Wis., a 6-cylinder 140-h.p., and a 12-cylinder 275-h.p. Both models use 5 by 6½-inch cylinders. The most notable feature of these engines is the size of the valves, which are 3 inches in diameter. The cylinders are made of aluminium alloy. The cam-shaft drive in the 12-cylinder model is through spur gears, in the 6-cylinder model through bevel gears. This feature is the main difference in design between the 6 and the 12-cylinder engines. The crank case is made of aluminium, the crank-shaft of chrome vanadium steel, and this material is also used in the tabular connecting rod. The pistons are made of aluminium alloy and weigh only 2 pounds each.

The water circulation is by a cylindrical pump. The lubricating system is one of the main features of the engines, being designed to work at any angle. No splash is used in the crank case, the system being full-forced feed. Ignition is by two Bosch magnetos, each one firing the entire engine. The Zenith duplex carburettor is used and two Zenith duplex carburettors are used in the 12-cylinder engine. The engines are notable for

their accessibility. The many years of experience which the Wisconsin Motor Manufacturing Company has had in building marine, automobile and racing gasoline engines have been a distinct advantage in the development of the V-6 and V-12 aeroplane models. The engineers of the company, in developing these models, have also given close attention to standard foreign practice.

World's Motor Corporation.

A two-cycle rotary engine of 70-h.p. of 5-cylinder 4.5-inches bore by 4½ inches stroke which develops its rated horse-power at 1,000 revolutions, called the Frederickson engine, is being built by the World's Motor Corporation of Bloomington, Ill. The officers of the Company are anxious to have aeroplane manufacturers examine this engine very carefully as it is said to embody many principles in design that are absolutely new.

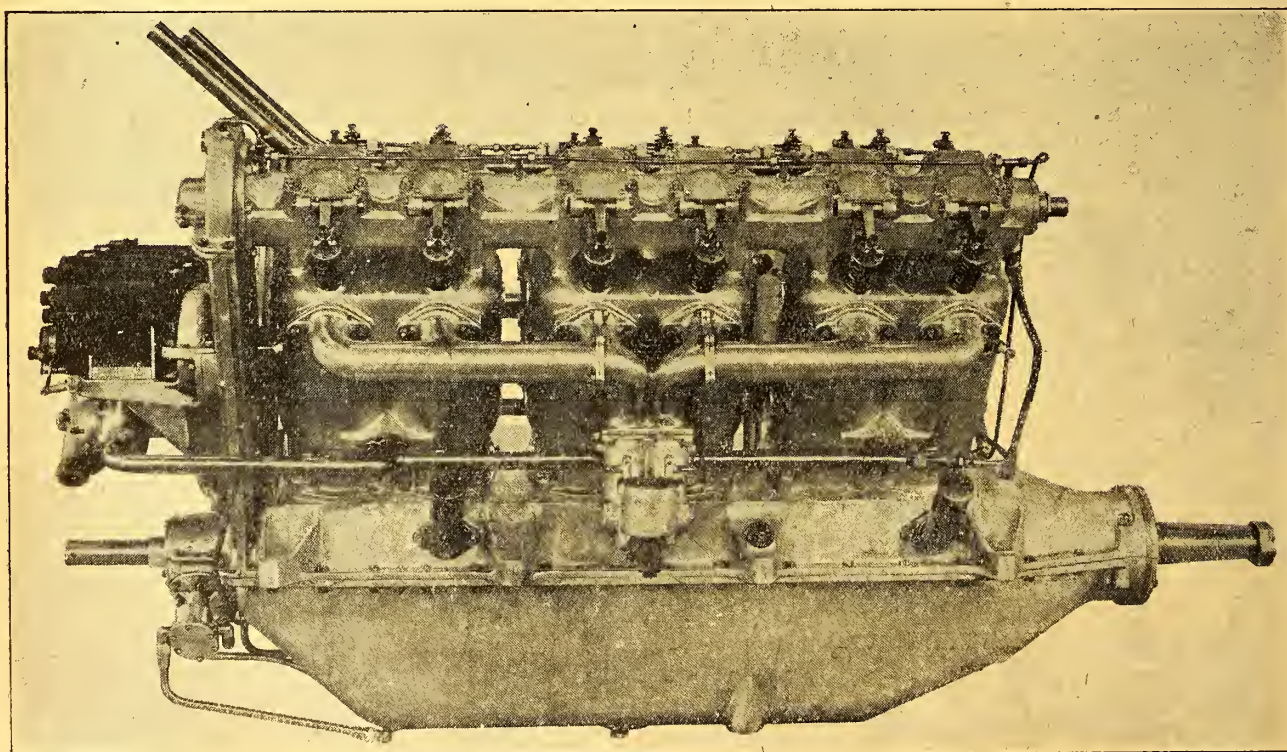
Wright-Martin Aircraft Corporation.

Mr. Henry Crane, of the Crane Simplex Motor Car Company, brought back from Europe about a year ago plans and specifications of the Hispano-Suiza 8-cylinder water-cooled aircraft engine, which has proven highly successful in the French aviation service, and which is still considered the best 150-h.p. engine that the Allies are using in their air service to-day. The Wright-Martin Corporation, which owns all the stock of the Crane Simplex Motor Car Company, has a contract for at least 450 of these Hispano-Suiza engines to be sold to the Allies, and the engines are being built in the company's plant at New Brunswick, N. J.

Few details in regard to the engine are available for publication. It is of the 8-cylinder, water-cooled V-type, the low weight and high power being maintained through careful manufacturing rather than by any radical departure from standard aeroplane engine design. The tolerances permitted in the manufacture of this engine are extremely small and nearly all parts are machined and fitted so that gaskets are practically done away with.

The Hispano-Suiza was originally built in Spain, where the chairman of the board of directors of the company is His Majesty Alphonso XIII. Many improvements in the engine as originally put out have been made so that the product being manufactured at New Brunswick differs considerably from the early engines which were first built in Spain. In the early engines a combination of air and water cooling was used and the cylinders were fitted with 9 cooling flanges each. The new engine is water-cooled throughout.

One of the engines built at the New Brunswick plant has recently been installed in an aeroplane designed by Chauncey Vought, of the Wright-Martin Aircraft Corporation, and the plane has been satisfactorily demonstrated at Dayton, Ohio. Deliveries of these engines to the Allies are expected to commence in the near future.



The New Wisconsin Engine, 12-Cylinder, 275-h.p.



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AMERICAN AEROPLANES OF TO-DAY.

(Compiled by "Aviation and Aeronautical Engineering," New York, February 1st, 1917.)

Maker's Name and Model	Span		Chord	Gap	Length Overall	Dihedral	Sweep Back	Stagger	Total Wing Surface	Ailerons on	Tractor or Pusher	Landing Gear	Engine Make and H.P.	Weight with Engine and 1 Hrs. Fuel	Useful Load	No. of Passengers
	Top	Bottom														
Amer. Aircraft Co. of Ind.	48'7½"	35'0"	5'6"	6'6"	25'0"	..	..	..	..	..	T.	..	..	1600	930	..
Atl. Aircraft Co. Twin....	48'0"	48'	6'	7'	28'6"	0°	0°	0°	550 sq. ft.	Both	T.	4 wheel	2 Aeromarine 35 H.P.	..	..	2
Aeromarine M-1.....	37'0"	33'0"	..	..	..	..	..	..	420 sq. ft.	..	T.	2 wheel	100 H.P.	..	..	2
Benoist H-17.....	45'0"	45'0"	5'3"	5'0"	24'0"	0°	0°	0°	455 sq. ft.	Upper wings	T.	2 or 3 wheel	Roberts 100 H.P.	1700	600	..
Benoist K-17.....	75'0"	65'0"	5'3"	5'0"	..	0°	0°	0°	705 sq. ft.	Upper wings	P.	3 wheel	2 Roberts 100 H.P.	2700	1300	..
Benoist E-17.....	45'0"	45'0"	5'3"	5'0"	..	0°	0°	0°	455 sq. ft.	Upper wings	T.	Boat	Roberts 100 H.P.	1700	600	..
Benoist C-17.....	75'0"	65'0"	5'3"	5'0"	..	0°	0°	0°	705 sq. ft.	Upper wings	P.	Boat	2 Roberts 100 H.P.	2800	1200	..
Burgess Dunne (New)	46'6"	46'6"	6'9"	6'6"	31'	0°	30°	2'8"	650 sq. ft.	Upper & lower	P.	1 Pontoon	140 H.P.	..	..	2
Burgess Dunne Seaplane	46'0"	..	..	..	23'0"	0°	..	..	..	..	P.	..	100 H.P.	..	650	2
Burgess Dunne Navy Seaplane.....	45'2"	..	..	..	21'10"	0°	..	..	..	..	P.	..	140 H.P.	..	750	2
Burgess Hydroaeroplane.	46'9"	..	..	..	30'6"	0°	..	..	..	..	T.	..	100 H.P.	..	640	2
Burgess Land Machine..	46'9"	..	..	..	30'6"	0°	..	..	..	..	T.	..	100 H.P.	..	860	2*
Burgess Land Machine.	49'0"	..	..	..	27'6"	0°	..	..	..	..	T.	..	100 H.P.	..	1000	2
Curtiss JN 4-B.....	43'7¾"	33'11¼"	4'11½"	5'2¾"	27'3"	1°	0°	1'½"	359.69 sq. ft.	Upper wings	T.	2 wheel	Curtiss OX 90 H.P.	1400	585	2
Curtiss Twin JN.....	52'9¾"	43'1¾"	4'11½"	5'2½"	29'	4½°	0°	9½°	450.28 sq. ft.	Upper wings	Twin T.	2 wheel	2 Curtiss OXX 200 H.P.	2225	1040	2
Curtiss R4.....	48'4½"	38'5½"	6'3½"	6'2½"	28'11½"	3°	0°	10½°	450.52 sq. ft.	Upper & lower	T.	2 wheel	Curtiss V2 200 H.P.	2300	1020	2
Curtiss N-9.....	53'3¾"	43'0¾"	5'0"	5'0"	29'10"	0°	0°	9'½"	496.13 sq. ft.	Upper wings	T.	1 Pontoon	Curtiss OXX 100 H.P.	2000	510	2
Curtiss F.....	45'2"	35'0"	5'2"	5'11"	28'0"	0°	0°	0°	420 sq. ft.	Upper wings	P.	Boat	Curtiss OX 90 H.P.	1500	600	2
Kyle Smith P.I.....	32'0"	22'0"	4'6"	4'6"	23'9"	1.5°	0°	20%	245 sq. ft.	Upper wings	T.	2 wheels	6 cylinder Radial	625	600	1
Lanzius L-1.....	38'0"	38'0"	5'6"	5'3"	25'0"	..	..	..	400 sq. ft.	Lanzius Patent	T.	2 wheels or 2 floats	Duesenberg 140 H.P.	1400	800	..
Lanzius L-2.....	28'0"	28'0"	4'0"	4'7"	24'0"	..	..	..	220 sq. ft.	Lanzius Patent	T.	2 wheels or 2 floats	Duesenberg 140 H.P.	1200	800	..
L. W. F.....	..	..	..	6'6"	..	1°	10°	10°	490 sq. ft.	Upper wings	T.	2 wheels	Thomas 135 H.P.	..	..	2
Lawrence-Lewis A-1....	30'0"	..	6'0"	4'8"	25'0"	..	..	6°	..	None	T.	Combined land and water	140 H.P. Hall-Scott A 5-a	1750	800	..
Lawrence-Lewis B-1....	42'0"	..	7'6"	5'8"	29'0"	..	..	6°	..	None	T.	Combined land and water	140 H.P. Hall-Scott A 5-a	2200	1500	..
M. F. P.....	45'0"	38'3"	5'3"	5'6"	27'0"	0°	0°	0°	..	Top Plane	T.	2 wheels	125 H.P. Hall-Scott	..	..	2
N.Y. Aero Constr. Co. A-1.	73'0"	44'0"	Top 7'6" Bot 6'6"	6'9"	37'0"	0°	0°	8'	820 sq. ft.	Upper wings	T.	2 floats	2 Hall-Scott 100 H.P. A 7-a	2822	1700	..
N.Y. Aero Constr. Co. A-2.	73'0"	44'0"	Top 7'6" Bot 6'6"	6'9"	34'0"	0°	0°	8'0"	820 sq. ft.	Upper wings	T.	4 wheels	2 Hall-Scott 100 H.P. A 7-a	2472	2050	..
Pacific Aero Products...	52'0"	43'6"	5'9"	6'6"	27'5"	2½°	0°	0°	480 sq. ft.	Upper wings	T.	2 floats	Hall-Scott 125 H.P.	2750	700	2
S. S. Pierce Co.....	26'0"	20'0"	4'0"	5'6"	20'0"	0°	0°	1'	184 sq. ft.	Upper wings	T.	2 wheels	S. S. Pierce B-35-40 H.P.	660	..	1
Standard H-3.....	40'1"	40'1"	6'6"	6'6"	27'0"	3°	10°	1'3"	491 sq. ft.	Both	T.	2 wheels	Hall-Scott 140 H.P. A 5-a	2700	800	2
Standard J.....	44'0"	32'0"	6'0"	5'11"	26'7"	3°	5°	10°	433 sq. ft.	Upper wings	T.	3 wheel type	Hall-Scott 90 H.P. A-7	1750	500	2
Standard D Twin.....	62'4"	49'	7'0"	7'0"	33'6"	3°	0°	0°	760 sq. ft.	Upper wings	T.	2 floats	2 Hall-Scott A-5a 140 H.P. each	3300	1350	..
Standard Speed Scout..	26'6"	26'6"	5'0"	5'6"	22'7¾"	3°	10°	15°	225 sq. ft.	Both	T.	2 wheels	Hall-Scott 125 H.P. A-9	1192	425	..
Sturtevant S-4.....	49'6"	49'6"	7'0"	6'9"	28'0"	..	..	..	620 sq. ft.	Both	T.	2 wheels or 2 floats	Sturtevant 5-A 140 H.P.	2025	525	2
Thomas R. D.-5.....	52'9"	34'	5'6"	5'3"	29'9"	4°	0°	0°	465 sq. ft.	Upper wings	T.	2 wheels	Thomas Model 8 135 H.P.	2500	1100	2
United Eastern Aeroplane Corp. H-M.....	39'0"	30'0"	5'6"	6'0"	25'6"	1°	8°	9°	350 sq. ft.	Upper	T.	2 wheels	Curtiss OXX-2 100 H.P.	1200	800	..

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American Aeroplanes of To-day—(continued).

Maker's Name and Model	Span		Chord	Gap	Length Overall	Dihedral	Sweep Back	Stagger	Total Wing Surface	Ailerons on	Tractor or Pusher	Landing Gear	Engine Make and H.P.	Weight with Engine and 1 Hrs. Fuel	Useful Load	No. of Passengers
	Top	Bottom														
United Eastern Aeroplane Corp. A-M.....	42'0"	37'0"	6'0"	6'0"	29'6"	1°	None	9'	436 sq. ft.	Upper wings	T.	Single Float	Curtiss OXX-2 100 H.P.	1430	500	..
United Eastern Aeroplane Corp. A-N.....	45'0"	45'0"	6'0"	6'0"	28'3"	1°	None	9'	482 sq. ft.	Both planes	T.	2 wheels	Hall-Scott 125 H.P. A-5	1550	900	..
Verville Gama S.....	40'0"	34'0"	5'0"	5'0"	25'10"	5°	0°	8"	350 sq. ft.	Upper wings	P.	2 floats	Curtiss OXX-2 100 H.P.	1500	450	2
Verville Beta.....	43'0"	37'0"	5'0"	6'0"	28'7"	Upper 0° Lower 5°	0°	9'	400 sq. ft.	Top plane	P.	Boat	100 H.P.	1640	350	2
Verville Gama L.....	40'0"	34'0"	5'0"	5'0"	25'0"	5°	0°	8"	350 sq. ft.	Top plane	P.	2 wheels	100 H.P.	1360	600	2
Wittegan T.T.....	42'0"	34'0"	5'6"	5'6"	27'2"	1½°	0°	0°	391 sq. ft.	..	T.	2 wheels	Hall-Scott A-7, 90 H.P.	1460	550	..
Wright-Martin R.....	50'8"	36'10"	5'6"	6'0"	26'8"	1°	0°	17'	458 sq. ft.	Upper wings	T.	2 wheels	Hall-Scott A-5, 125 H.P.	2005	880	2
Wright-Martin V.....	39'8.5"	39'8.5"	5'9.5"	5'7"	27'2"	1°15'	0°	1'0"	430 sq. ft.	Both planes	T.	2 wheels	Simplex Model A Hispano-Suiza 150 H.P.	1725	805	..

AMERICAN ENGINES OF TO-DAY.*

Maker's Name and Model	Number of Cylinders	Bore (Inches)	Stroke (Inches)	Piston Displacement (Cubic Inches)	H.P.	R.P.M.	Weight of Engine with Carburetor and Ignition	Gas Consumption
Aeromarine.....	6	4½	5½	449	85	1400	440	....
Aeromarine D-12.....	12	4½	5½	....	....	....	750	....
Brookmalt X.....	6	3½	4	....	24	....	...	....
Curtiss OX.....	8	4	5	502.6	90	1400	375	....
Curtiss OXX-2.....	8	4¼	5	567.5	100	1400	423	....
Curtiss V-2.....	8	5	7	1100	200	1400	690	....
Duesenberg A-4.....	4	4¾	7	496	140	2100	455	....
Duesenberg V-12.....	12	4¾	7	1488	250	1800	923	....
General Ordnance Type L.M.....	8	4¾	6½	920	200	....	876¼	....
General Vehicle Gnome Mono....	9	4.33	5.9	848	100	1200	272	12 gals. per hour at rated H.P.
Gyro K.....	7	4½	6	....	90	1250	215	8 gals. per hour at rated H.P.
Gyro L.....	9	4½	6	859	100	1200	285	10 gals. per hour at rated H.P.
Hall-Scott A-7.....	4	5	7	550	90-100	1400	410	....
Hall-Scott A-5.....	6	5	7	825	125	1300	592	....
Hispano Suiza.....	8	4½	5	672	154	1500	455	....
Knox Motors Co.....	12	4¾	7	1555	300	1800	1423	31.5 gals. per hr.
Maximotor A-6.....	6	4½	5	477	85	1600	340	....
Maximotor B-6.....	6	5	6	706.8	115	1600	385	....
Maximotor A-8.....	8	4½	5	636	115	1600	420	....
Orlo B-4.....	4	4½	5	....	50	1300	220 (bare)	....
Orlo B-6.....	6	4½	5	....	75	1300	270 (bare)	....
Orlo B-8.....	8	4½	6	753.3	105	1300	480 (bare)	....
Packard 12.....	12	4	6	903	225	2100	800	....
Rausenberger C-12.....	12	4½	6	930	160	1400	700	....
Sturtevant 5.....	8	4	5½	552.9	140	2000	580	....
Sturtevant 5-A.....	8	4	5½	....	140	2000	514	13.75 gals. per hr.
Thomas 8.....	8	4	5½	552.9	135	2000	630 with self-starter	59 lbs. per B.H.P. hr.
Thomas 88.....	8	4½	5½	552.9	150	2100	525 lbs. with self-starter	59 lbs. per B.H.P. hr.
Wisconsin.....	6	5	6½	765.7	140	1380	637
Wisconsin.....	12	5	6½	15.32	250	1200

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REVIEWS AND RECORDS.

By ERIC HILDESHEIM, B.A. COPENHAGEN.

The current issue being devoted to reviews it is only fitting to publish the development up to the outbreak of war of the three chief records, namely: those for duration, altitude and speed, as well as the distance records at that time. Figures speak their own short, yet distinct tale, and no science can show a more thrillingly quick development than aviation, the youngest child of the internal combustion engine family in the wider engineering world.

DURATION.

When read with reflection these records unveil much interesting information; the duration records thus tell us that the first figures

are the results of the early American and French competition. By the end of 1909 France had, however, shaken off the Wright, and progress was now chiefly marked by the final dates of the Michelin prizes for duration flights each year—at first, December 31st, and later, September 30th.

Competition for money did not, however, advance figures beyond Fourny's 13 hours performance in 1912, till the time of national competition came in, when German aviators were offered prize money for every record captured, to be doubled if the latter was formerly foreign property.

The evidence hereof is the avalanche of records from Langer's 14 hours to Boehm's 24 hours performance, when the avalanche

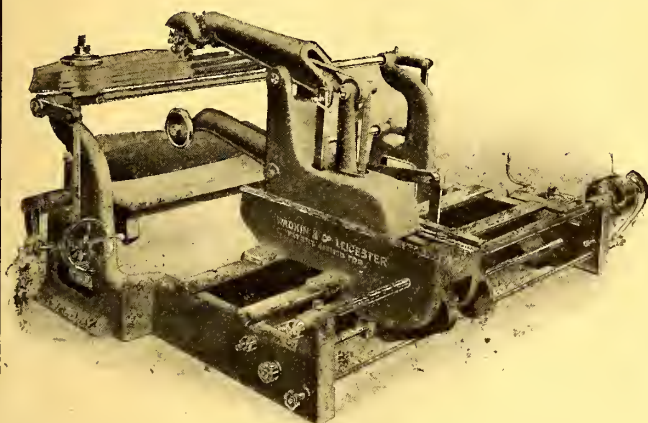
THE PROGRESS OF THE DURATION RECORD.

NAME.	AEROPLANE.	ENGINE.	PLACE.	DATE.	TIME.		
					hrs.	min.	sec.
Santos Dumont ...	Santos Dumont ...	50-h.p. Antoinette	Bagatelle	Nov. 12, 1906	0	0	21
Henry Farman ...	Voisin	40-h.p. Vivinus ...	Issy	Oct. 26, 1907	0	0	52
Henry Farman ...	Voisin	50-h.p. Antoinette	Issy	Jan. 13, 1908	0	1	28
Henry Farman ...	Voisin	50-h.p. Antoinette	Issy	March 21, 1908	0	3	39
Léon Delagrangé	Voisin	40-h.p. Vivinus ...	Issy	April 11, 1908	0	6	30
Léon Delagrangé	Voisin	50-h.p. E.N.V. ...	Rome	May 30, 1908	0	15	26
Henry Farman ...	Voisin	50-h.p. Antoinette	Issy	July 6, 1908	0	20	19
Léon Delagrangé	Voisin	40-h.p. Vivinus ...	Issy	Sept. 6, 1908	0	29	53
Wilbur Wright ...	Wright	24-h.p. Wright ...	Auvours	Sept. 21, 1908	1	31	25
Wilbur Wright ...	Wright	24-h.p. Wright ...	Auvours	Dec. 18, 1908	1	54	53
Wilbur Wright ...	Wright	24-h.p. Wright ...	Auvours	Dec. 31, 1908	2	20	23
Louis Paulhan ...	Voisin	50-h.p. Gnome ...	Béthény	Aug. 27, 1909	2	43	24
Henry Farman ...	H. Farman	50-h.p. Gnome ...	Béthény	Aug. 27, 1909	3	4	56
Henry Farman ...	H. Farman	50-h.p. Gnome ...	Mourmelon	Nov. 3, 1909	4	17	53
Labouchère	Antoinette	50-h.p. Antoinette	Reims	July 9, 1910	4	19	0
Jan Olieslaegers	Blériot	50-h.p. Gnome ...	Reims	July 10, 1910	5	3	5
Maurice Tabuteau	M. Farman	70-h.p. Renault ...	Etampes	Oct. 28, 1910	6	0	0
Henry Farman ...	H. Farman	50-h.p. Gnome ...	Etampes	Dec. 18, 1910	8	12	23
Fourny	M. Farman	70-h.p. Renault ...	Buc	Sept. 1, 1911	11	1	20
Fourny	M. Farman	70-h.p. Renault ...	Buc	Sept. 11, 1912	13	17	57
Langer	L. F. G. Roland ...	100-h.p. Mercédès	Johannisthal	Feb. 4, 1914	14	7	0
Poulet	Caudron	50-h.p. Gnome ...	Etampes	April 24, 1914	16	28	56
Basser	Rumpler	100-h.p. Mercédès	Johannisthal	June 24, 1914	18	10	0
Landmann	Albatros	100-h.p. Mercédès	Johannisthal	June 28, 1914	21	50	0
Boehm	Albatros	100-h.p. Mercédès	Johannisthal	July 10, 1914	24	14	0

THE PROGRESS OF THE DISTANCE RECORD.

NAME.	AEROPLANE.	ENGINE.	PLACE.	DATE.	DISTANCE.	
					yards.	metres
Santos Dumont ...	Santos Dumont	50-h.p. Antoinette	Bagatelle	Sept. 14, 1906	8.6	7.8
Santos Dumont ...	Santos Dumont	50-h.p. Antoinette	Bagatelle	Nov. 12, 1906	244.4	220
Henry Farman ...	Voisin	40-h.p. Vivinus ...	Issy	Oct. 26, 1907	855.5	770
Henry Farman ...	Voisin	50-h.p. Antoinette	Issy	Jan. 13, 1908	miles. 0.625	1
Henry Farman ...	Voisin	50-h.p. Antoinette	Issy	March 21, 1908	1.25	2
Léon Delagrangé	Voisin	40-h.p. Vivinus ...	Issy	April 11, 1908	2.50	4
Léon Delagrangé	Voisin	50-h.p. E.N.V. ...	Rome	May 30, 1908	7.7	13
Léon Delagrangé	Voisin	40-h.p. Vivinus ...	Issy	Sept. 6, 1908	15.3	24
Léon Delagrangé	Voisin	40-h.p. Vivinus ...	Issy	Sept. 17, 1908	41.5	67
Wilbur Wright ...	Voisin	24-h.p. Wright ...	Auvours	Sept. 21, 1908	60.9	974
Wilbur Wright ...	Wright	24-h.p. Wright ...	Auvours	Dec. 18, 1908	62	100
Wilbur Wright ...	Wright	24-h.p. Wright ...	Auvours	Dec. 31, 1908	77.5	125
Henry Farman ...	H. Farman ...	50-h.p. Gnome ...	Reims	Aug. 26, 1909	112	180
Henry Farman ...	H. Farman ...	50-h.p. Gnome ...	Mourmelon	Nov. 3, 1909	150	240
Jan Olieslaegers	Blériot	50-h.p. Gnome ...	Reims	July 10, 1910	139.5	225
Jan Olieslaegers	Blériot	50-h.p. Gnome ...	Reims		245	393
Maurice Tabuteau	M. Farman ...	70-h.p. Renault ...	Buc-Etampes	Oct. 28, 1910	290	465
Maurice Tabuteau	M. Farman ...	70-h.p. Renault ...	Etampes	Dec. 30, 1910	362.7	585
Jan Olieslaegers	Blériot	50-h.p. Gnome ...	Kiewitt	July 16, 1911	393.7	635
Fourny	M. Farman ...	70-h.p. Gnome ...	Buc	Sept. 1, 1911	448.3	723
Gobé	Nieuport	70-h.p. Gnome ...	Pau	Dec. 24, 1911	460	740
Fourny	M. Farman ...	70-h.p. Renault ...	Etampes	Sept. 11, 1912	633	1017
Landmann	Albatros	100-h.p. Mercédès	Johannisthal	June 28, 1914	1178	1900

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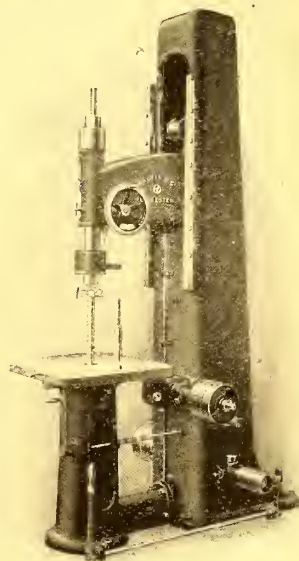
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took shortly afterwards the field of records over the enemy lines. By the way, an interesting comment on Boehm's flight is that his very identical Albatros biplane had earlier gone through the 1914 Prince Henry flight under Thelen's pilotage, as well as putting up Landmann's 21 hours' record and one of 17 hours on the day of Basser's performance, yet had not received official recognition, as Landmann had to land unobserved outside the Johannisthal aerodrome, driven off his course by a thunder-storm. Indeed some early tale of German efficiency!

DISTANCE.

A comparison of the record development lists of duration and distance may, at first glance, easy lead to the belief that they are rather one and same, and beyond a decision of newer date, taken by the Federation Aéronautique Internationale, "that only one record can be recognised for every flight," the reasons herefore would be obvious. As a matter of fact, when the biplane had the field for itself in the early days, long flights were bound to bring the pilots both distance and duration record honours, but when the monoplane had established itself there was always the chance of a monoplane snatching away comparatively easily and at less petrol expense what a biplane pilot had in long hours spent aloft summoned up of total mileage.

In which way Olieslaegers on a Blériot twice and Gobé on Nieuport once deprived Henry and Maurice Farman biplane pilots of half their double victory.

It is obvious, too, that whereas a duration record may take the rather easy form of a walking trip, pending round above an aerodrome, a distance record flight must, to be reckoned with and measured, more or less take the form of a cross-country flight. Which justifies us in this place, though it was, owing to intermediary stops, only "some" distance flight, though of more than one meaning, paying honour to the finest flight yet performed, namely, Stoeffler's 24 hours' performance of 2,160 kms. or 1,300 miles on Oct. 4th, 1913.

That Fourny's 13 hours' and 1,017 km. flight should stand unrivalled for one year and a half was a proof that the pilots of the unstable aeroplanes of those days had reached the limit in what they could tackle of strains. They had to wait for 1914 German "arrow" biplanes and French flexible winged Caudrons to better their performances. In other words, the much discussed "natural stability" had had a word to say, and also the load-carrying capacity of the biplane, as the monoplane has really been out of play since.

From the above-mentioned reason of sticking to aerodrome air the first 1914 German duration records have no right to be registered under this heading; but due consideration must be given to the outstanding distance of 1,900 kms. (1,150 miles) of Landmann's. Being the most important record to register—combined, of course, with the one of duration—the rise of the distance record has always been anxiously followed, especially by those pilots whom the Atlantic flight continually haunted. "1,900 km. performed. 2,300 km. the limit of Atlantic distance! I will run the risk for fame and money—or money and fame—according to individuality."

ALTITUDE.

Altitude flights have always been the hobby of French aviators *par excellence*, and of special individuals; too, as the same names will often appear time after time, which is no general rule in the world of aviation, where aviators are bred more or less by generations. Latham is the predominating name of early days, Garros and Legagneux those of later times.

At one time American exhibition aviators, like the Wright pilots Hoxsey and Brookins, satisfied their love for thrills by entering altitudes then unreachd by aeroplanes, and in 1914 the German national-cum-money policy bore further results in this field of activities, enabling Linnekogel, who had always sought the higher regions, keeping all German altitude records, and together with Hellmuth Hirth some of the world's records with passengers, to beat Legagneux's years-old performance. Linnekogel shared even Latham's love for smoke, his pipe being as indispensable to him as the cigarette to the latter.

As it was a common opinion that monoplanes come in especially for high flights, special attention should be paid to Loridan's Farman, when he beat the record on this mount, and might be extended, too, to the last record of Oelerich, as his D.F.W. biplane had had no special tuning for the record flight. Oelerich himself had, interestingly enough, never before attempted this sort of flying.

SPEED.

The speed record the French have always thought to have for themselves. The various Gordon-Bennett races have here been the milestones of progress. Victory in the first, one during the famous Reims week, went to America with the Curtiss biplane, the only time a biplane won this speed contest. France rather had hard luck in bringing the cup back, though French aeroplanes were victorious every year.

ALTITUDE RECORDS.

NAME.	AEROPLANE.	ENGINE.	PLACE.	DATE.	HEIGHT.	
					Metres	Feet
Henry Farman ...	Voisin	40-h.p. Vivinus ...	Issy	Nov. 13, 1908	25	82
Wilbur Wright ...	Wright	24-h.p. Wright ...	Auvours	Nov. 13, 1908	25	82
Wilbur Wright ...	Wright	24-h.p. Wright ...	Auvours	Dec. 18, 1908	110	360
Louis Paulhan ...	Voisin	50-h.p. Gnome ...	Douai	July 18, 1909	150	492
Hubert Latham ...	Antoinette	50-h.p. Antoinette	Reims	Aug. 29, 1909	155	508
Rougier	Voisin	50-h.p. E.N.V. ...	Brescia	Sept. 20, 1909	193	633
De Lambert	Wright	24-h.p. Wright ...	Juvisy	Oct. 18, 1909	300	984
Hubert Latham ...	Antoinette	50-h.p. Antoinette	Chalons	Dec. 1, 1909	453	1,436
Hubert Latham ...	Antoinette	50-h.p. Antoinette	Chalons	Jan. 7, 1910	1,050	3,444
Louis Paulhan ...	H. Farman	50-h.p. Gnome ...	Los Angeles	Jan. 12, 1910	1,269	4,110
Walter Brookins	Wright	40-h.p. Wright ...	Indianapolis	June 14, 1910	1,335	4,379
Hubert Latham ...	Antoinette	50-h.p. Antoinette	Reims	July 7, 1910	1,384	4,539
Walter Brookins	Wright	40-h.p. Wright ...	Atlantic City	July 10, 1910	1,900	6,237
Armstrong Drexel	Blériot	50-h.p. Gnome ...	Lanark	Aug. 11, 1910	2,013	6,603
Léon Morane	Blériot	50-h.p. Gnome ...	Le Havre	Aug. 29, 1910	2,150	7,042
Léon Morane	Blériot	50-h.p. Gnome ...	Deauville	Sept. 3, 1910	2,582	8,469
Geo. Chavez	Blériot	50-h.p. Gnome ...	Issy	Sept. 8, 1910	2,587	8,484
Jau Wijnmalen ...	H. Farman	50-h.p. Gnome ...	Mourmelon	Oct. 1, 1910	2,780	9,118
Ralph Johnstone	Wright	60-h.p. Wright ...	Belmont Park, N.Y.	Oct. 31, 1910	2,960	9,600
Geo. Legagneux	Blériot	50-h.p. Gnome ...	Pau	Dec. 9, 1910	3,100	10,168
Arch. Hoxsey ...	Wright	60-h.p. Wright ...	Los Angeles (Unoffil.)	Dec. 26, 1910	—	11,474
Loridan	H. Farman	70-h.p. Gnome ...	Buc	July 9, 1911	3,200	10,496
Captain Felix ...	Blériot	70-h.p. Gnome ...	Etampes	Aug. 5, 1911	3,350	10,988
Lincoln Beachey	Curtiss	60-h.p. Curtiss ...	Chicago	Sept. 4, 1911	3,527	11,578
Roland Garros ...	Blériot	70-h.p. Gnome ...	St. Malo	Sept. 6, 1911	3,950	12,824
Roland Garros ...	Blériot	70-h.p. Gnome ...	Dinard	Sept. 6, 1911	4,960	16,269
Geo. Legagneux	Morane	80-h.p. Gnome ...	Issy, Villalonblay ...	Sept. 17, 1912	5,450	18,050
Roland Garros ...	Morane	80-h.p. Gnome ...	Tunis	Dec. 11, 1912	5,610	18,400
Edward Perreyon	Blériot	80-h.p. Gnome ...	Buc	March 11, 1913	5 880	19,290
Geo. Legagneux	Nieuport	60-h.p. Le Rhone	St. Raphael	Dec. 29, 1913	6,120	20,060
Gino Linnekogel	Rumpler	100-h.p. Mercédès	Johannisthal	July 9, 1914	6,600	21,653
Harry Oelerich ...	D.F.W.	100-h.p. Mercédès	Leipzig	July 14, 1914	7,850	25,725

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In 1910, at Belmont Park, New York, petrol lack put Leblanc out of competition after 95 miles out of 100 miles with superior time, leaving victory to Grahame-White and England.

In 1911, at Eastchurch, Nieuport had to be content to see his name win with the Haitian-American Weymann as pilot, being himself only third, and Leblanc having again bad luck, still suffering from sea-sickness, caused by crossing the Channel in a boat, while flying a special tiny-planed Blériot.

In 1912, at Chicago, victory was finally all French in America, Jules Vedrines on Deperdussin. And at Reims in 1913, Prévost on a similar monoplane, but with the horse-power increased from 100 to 160 Gnome, made the last official speed record 204 km. in the hour, the flying speed of Emile Vedrines on 160-h.p. le Rhone-Ponnier being similar.

These figures have been considerably beaten during the war time, and but for the war some fine sport was bound to have been put in at the 1914 Gordon-Bennett race, as German aeroplanes, like the D.F.W. biplane, had performed favourably in speed, and still better sport was to be expected from the Bristol and Sopwith scouts. The cup had likely gone again to a biplane, and the monoplane should in speed have been deprived of its last special feature.

LOOKING AHEAD.

To look a little ahead. The present war-time is full of experience which will be turned to account in the after-war aviation

and thus push record figures further on once more. By paying especial attention to detail work and through widened experience better results will be obtained from future aeroplanes in all-round work, including speed, and by means of special propellers and wing-curves and hydrogen feeding of the motor, the altitude record list shall no doubt be continued. And double- or multiple-engined aeroplanes shall put in increasing duration flights, and compete with the airship in load-carrying capacities.

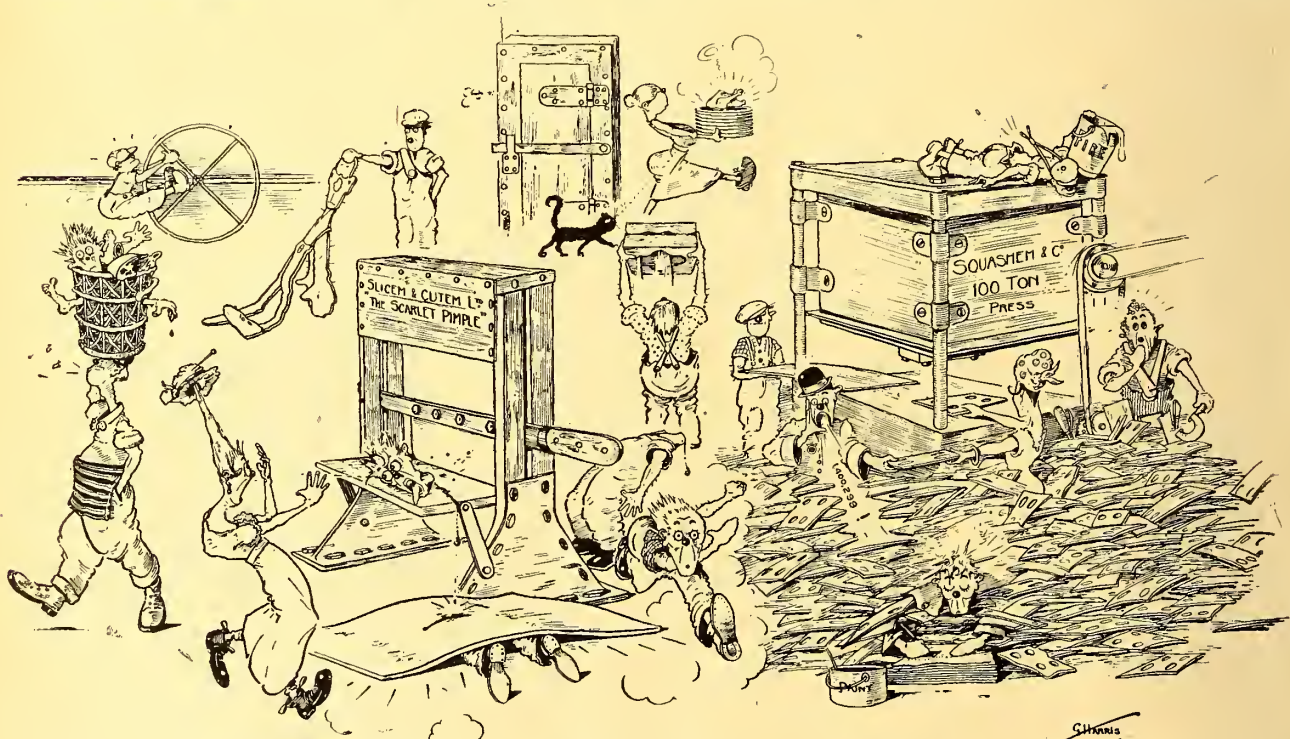
To mention a question much in the popular limelight, the Atlantic flight is, of course, now and henceforth easily within range of possibilities, whether one of the belligerent countries get the chance or a neutral country is meanwhile capable of putting in the necessary combined technical and organising work.

Be there room for personal views, the present writer will yet doubt the present form of aeroplanes being able to avoid coming to a standstill in development. The position might be similar to the early days of motor-cars, when the clumsy steam-driven carriages had to give way to the simpler petrol brother, after much useful information had been gathered from and through them.

A combination of the best features of to-day's aeroplanes with the idea of the helicopter into a "rotary aeroplane" might be the result; here for once the time-ruled policy, "Wait and see," is in its place, and over a *Qui vivra, verra*, we might meet again on "Reviews and Records" in another five to ten years.

SPEED RECORDS.

NAME.	AEROPLANE.	ENGINE.	PLACE.	DATE.	SPEED.	
					miles.	kilometre s.
Wilbur Wright ...	Wright	24-h.p. Wright ...	Auvours	Sept. 21, 1908	27.2	44
Léon Delagrange	Voisin	45-h.p. Antoinette	Juvisy	May 31, 1909	27.9	45
Capt. Ferber	Voisin	45-h.p. Antoinette	Juvisy	Sept. 3, 1909	29.7	48
Blériot	Blériot	60-h.p. E.N.V. ...	Reims	Aug. 28, 1909	47.7	77
Alfred Leblanc ...	Blériot	100-h.p. Gnome ...	Belmont Park	Oct. 29, 1910	67.5	109
C. Weymann	Nieuport	100-h.p. Gnome ...	Eastchurch	July 1, 1911	79.5	125
Jules Vedrines ...	Deperdussin ...	100-h.p. Gnome ...	Chicago	Sept. 9, 1912	105	170
Marcel Prevost ...	Deperdussin ...	160-h.p. Gnome ...	Reims	Sept. 29, 1913	126.5	204



SCENES IN AN AIRCRAFT FACTORY.—XIV.—THE PRESS SHOP.—On the right, a big press is hard at work. The gentleman gauging the plates has apparently burned himself, either through the speed with which he has worked his micrometer, or through holding a hot plate too long. His trouble will shortly be relieved by the assistant overhead with the fire bucket. The elegant press-worker's energy is so great that the charge-hand telling the number of plates delivered has nearly overwhelmed the tally-clerk with her output. Behind the press, a tool-shop hand discovers by the rays of light pouring between a pair of dies that their fit is not all that could be desired. Beyond him again, an assistant carries off the staff's dinner, which has been "hotted-up" in the annealing oven—according to time-honoured custom. The shop cat follows enviously.

In the left foreground, the worker of the big shears has made a clumsy mistake in feeding the machine, and gazes regretfully at his female helper, while his male helper hastens for a surgeon. Meanwhile, the sheet which should have been fed into the shears overwhelms a passing hand. On the extreme left the local butcher's boy removes the remnants of other machinery accidents. [N.B.—German readers are requested to note that we have not yet taken to devouring our casualties, either directly as butcher meat, or indirectly as pig-food, in the German manner. This is only the artist's little joke.—Ed.] Behind him, an energetic wire swager is at work, and in front of him, a worker inspects a friend who has been too closely concerned with a rolling-mill.

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700 " " " 254 BCE.....		4/8
2,200 " " " 256 ABC.....		8/6
2,700 " " " 252 BCE.....		4/6
3,200 " " " 252 ABC.....		4/6
350 " " " 253 ABC.....		4/6
3,200 " " " 255 ABC.....		7/6
4,500 " " " 255 BCE.....		7/6
290 " " " 257 ABC.....		9/0

(ABC = Fork and Eye. BCE = Double Eye).

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Gross	No.	B.S.F.	Type	Per Gross
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11	" T	88/0
30	109F	35/1
9	" K	45/0
10	" N	56/9
39	" S	72/6
2	" W	92/6

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6 Champ. Steel	161A	6/6
5 "	" B	6/6
50 "	" C	6/6
236 "	" D	6/6
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12 "	" F	6/6
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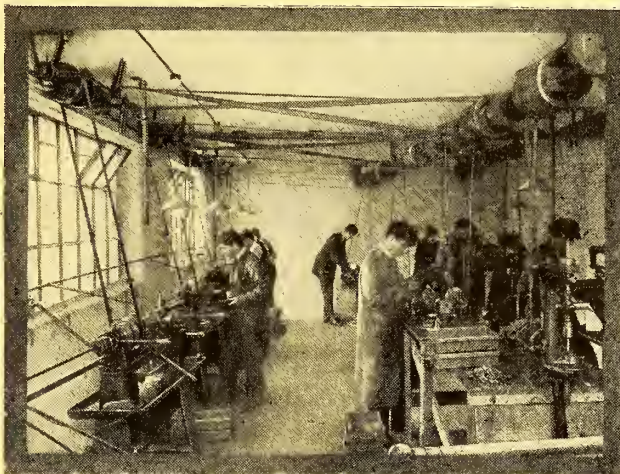
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AERO-MOTORS

IN KIND AND CONSTRUCTION

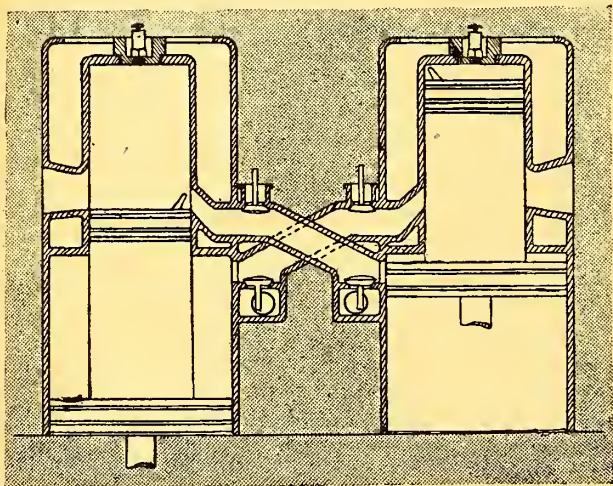
By Geoffrey de Holden-Stone



THE ORIGINS OF WISDOM.

Just as there is a distinct chain of circumstance between the clover crop and the marriage-rate in any year, so there is an equally clear connection between the one-while Board-school boy's "assault" summons and the present war. Some millions of fine British boy-material had grown up during the past twenty years or so, half-spoilt for want of the licking they never got in civil life. Some became porters; others Parliament-men; and all alike became pedants and theorists, utterly lacking the discipline of facts; so much so, that nothing short of such a war was capable of thrashing it into them.

It arrived: and presently the original number of one or two hundred thousand English gentlemen grew to several millions in khaki and blue. Some with pips and chevrons and brass braid; others without, but all of the same breed and heart and



The Duplex Two-Stroke: Original Working Scheme

soul; therefore of utter equality. Which means a superiority over pedants and politicians, place-hunters and profiteers, wholly immeasurable. As these latter are presently due to discover, very unpleasantly indeed, when the others come home.

All of which shows what an advantage it is to be brought beneath the rods of Life, and learn such uncommercial things as history and geography, when you are quite young. For both—especially history—teach one to look out for and notice wreck-buoys: to regard past failures with respect, not contempt; but to analyse them, not so much for the sake of winning success, as for the sake of trying to do so. Which is what chiefly matters.

HOW IT HAPPENS TO APPLY.

That is why—and if I repeat the fact I decline to apologise—nothing is more important in the practical study of i.c. motor design than its historical aspect. One sees, not solely what has been done, but what all the pioneers tried to do; what was aimed at, and why; and, above all, the reason for failure, as we shall then more probably see how little lay between that failure and success.

If, then, we can identify that little, and shape it as it was meant to be, there probably we shall score success; inheriting rather than winning it, to be quite honest with ourselves: but no matter.

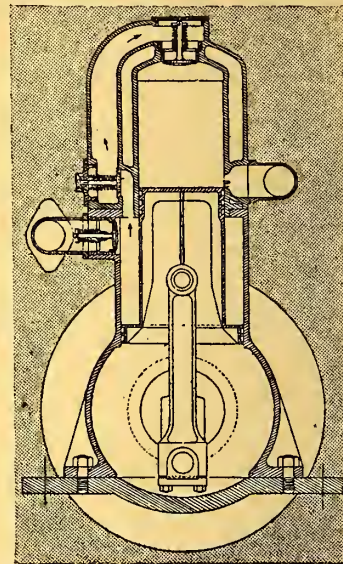
So, pursuing the historical vein—which I have to thank for anything I have ever learnt of two-stroke theory or practice—I would say that nothing has hindered the successful development of the near-ideal two-stroke motor as has the obsession of exhaust scavenge: through which designer after designer has come to grief.

The obvious moral is, do not attempt it, directly.

Gottlieb Daimler—and Ferdinand Forest before him—with the four-stroke, left the matter to take care of itself, after his earlier

attempts. These showed him the fact that a goodly proportion—perhaps as much as 30 per cent.—of the gases are left at the end of the working-stroke, *only half-burnt*; and can be used again, stratified under the new charge; provided only that the actually burned gases are free to escape, and that the pressure is thus relieved sufficiently to allow the half-burned gases to stratify, and the new charge to enter.

Incidentally, the Heasman results proved this. But it is the reason why—quite as much as for speed regulation—Daimler devised his hit - and - miss valve-gear mechanism. That the result was an economical and generally efficient motor, everyone will testify who ever ran one of the old Y-type or the later Phoenix-Daimler models. Indeed, had the valves of these motors been much bigger than coat-buttons, and had also the art of cam-profiling been understood—especially that of the ignition make-and-break—these old motors would probably have exhibited as high a piston-speed as the majority of the long stroke models of to-day. After all, the chief reason for any economy shown by to-day's types is that the length of the stroke gives time for completed combustion.

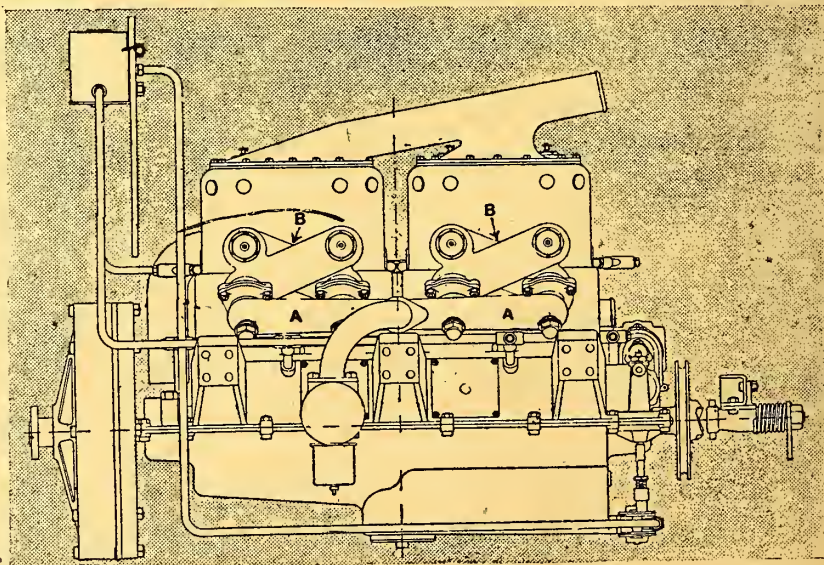


The Heasman Two-Stroke.

IN THE MATTER OF EXHAUST.

Consequently, on this train of reasoning, we can see that the entire advantage of the *échappement anticipé* auxiliary ports in all the many four-strokers to which they have been applied—from the Ville of 1904 to the exhaust-belted Adams of 1909—is due to the fact that they enable the gases actually burned to escape with the utmost rapidity, and relieve the pressure for the remainder of the exhaust to stratify as soon as the piston recloses the ports on the exhaust-stroke proper. Actually, the mushroom-valve above in such motors exhausts very little, but merely relieves the pressure still further to enable the induction to proceed the more effectually.

That is all about the matter; the obscure yet important fact



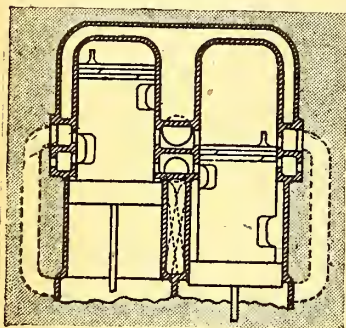
The Duplex Two-Stroke: Final Experiment.

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apparently overlooked by most designers; albeit its importance is never greater than in its relation to the development of the successful two-stroke. Only, the difference here is that whereas the desired result is obtained—or sought at least—by a combination of ports and variable valve action in the case of the four-stroke cycle, the equivalent result should be sought—and can only be obtained—with a two-stroke in the relative position and shaping of the exhaust ports; the only variation that valveless two-stroke practice permits.



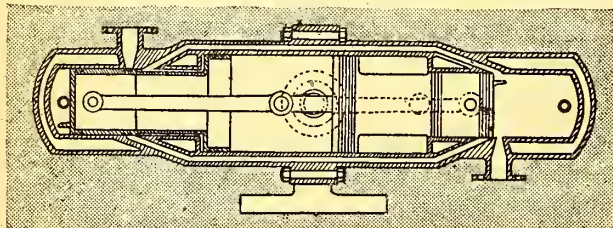
The Scott Experiment showing D Valve cavity in piston.

Thus he not only produced an extremely economical motor, but one that ran at an even temperature, which the most careless handling could not seem to vary, at any and all speeds from 100 to 2,500 r.p.m.

Clearly then—in view of these four-stroke results—it is the more evident that in the two-stroke—in which the cycle is twice as rapid—the effort should be *not* to scavenge half-burned gases that can be used again—albeit at the same time to exhaust the completely burned as rapidly as possible—and also that the heavier new charge must be introduced under a definite and irresistible pressure such as the pumping end of a differential-type piston best affords.

THE GREAT FRENCH EXAMPLE.

This latter feature—irrespective of exhaust relief nevertheless—governed the design of the valveless and pipeless horizontal



The Kolb-Danvin "Victoria" Two-Stroke.

"opposed" two-stroke motor patented—at least in France—by M. Charles Emile Kolb-Danvin, in 1905. This, as well be seen from the diagram, is probably one of the two or three simplest, mechanically, that was ever devised. Still, despite most successful trials, circumstances quite outside its merits as a motor proposition prevented its commercial exploitation, and the patents were disposed of.

Nevertheless, the chief defect of this motor—apart from a certain crudity of construction—was that both the piston head design and the position of the exhaust and inlet ports as well as their relation—which latter might just as well have been correct, inlet above exhaust—too nearly resembled Day-type practice to be economical of "mixture"; and thus lessened the advantage of the differential pistons which were a feature of the design.

This motor was admittedly before the day and demand of

aviators: but it is easy to see to-day that if it—as well as the subsequent vertical model—had been better studied in minute detail, and developed by the better shop-practice of an up-to-date firm, we might well have seen it actively in use to-day. I can only add that the opportunity still exists.

AND ITS SUCCESSOR.

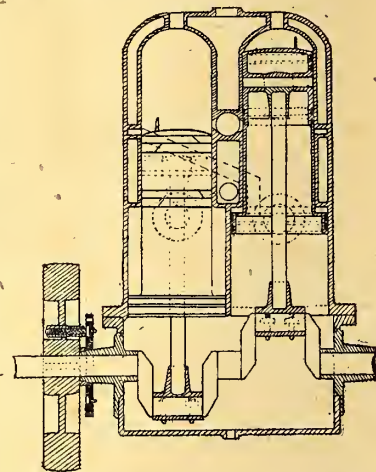
Since 1908, however, in conjunction with the "patents"—S.G.D.G., *bien entendu*—of MM. Prini and Berthaud, the "mass" of it appears to have been incorporated in the model called after M. Côte. And certainly no one who remembers how consistently the Côte motor of only 30-h.p. ran in the Coupe de l'Auto on the Boulogne Circuit, against motors of thrice its power—and withal in an ill-chosen trade-chassis twice too big and heavy to give it a chance—can doubt the efficiency of the design: or its suitability for aero-motor development.

Curiously enough, too, the only Côte motor ever brought to England was installed in an experimental tandem monoplane built at Mitchell's workshops in Wardour Street seven years ago.

At the same time, I cannot see that the Côte represents any real improvement on the Kolb-Danvin original. It is certainly valveless; as the horizontal passages in the induction manifold are so contrived as to be cut off from supplying any but the cylinder due for induction, by the differential piston trunks of the other three cylinders. But, the passages in question are so reversed upon one another as to destroy that free gas flow without backlash which is one of the main requirements of any motor; which, in fact, is the essential always emphasised particularly by Dugald Clerk and all other authorities. Also the great size and protuberance of the Côte-Prini-Berthaud manifold detract from the appearance of the motor.

Still, nothing counts so much as performance. Not only was the running of the Côte motor in the Coupe de l'Auto unexceptionable, and that, too, on a most trying course, but it does stand by itself as the only two-stroke motor which, up to three years ago, had proved its merit by any such searching road-test. We must, therefore, regard it as a distinct landmark in two-stroke practice and development, although there are to-day at least two others of British design which would far excel its best development, either on the road or aloft.

(To be continued.)



The "Victoria" Vertical Type similar to the Côte.

"AIRCRAFT SUPPLIES."

The third issue of the house journal of the Aircraft Supplies Co., Ltd., maintains the interest of its predecessors, and carries a lively scene of still better things to come in the near future.

In addition to the usual A.S.C. stock list, "Aircraft Supplies" contains an inquiry bureau, which gives replies to questions of interest asked by readers.

An article of considerable interest to those in the industry will be found in "Chasing Orders," by Mr. G. H. Mansfield.

A humorous series of suggested office regulations closes up a very interesting number.

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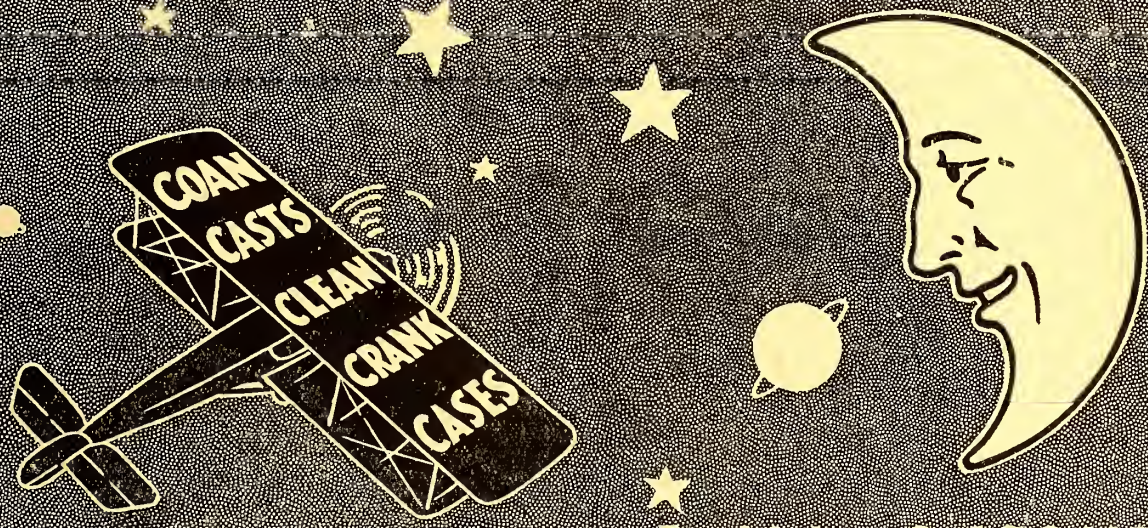
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STEELS USED IN AERO WORK.

On April 18th a meeting of the Aeronautical Society of Great Britain was held at the Royal Society of Arts, John Street, Adelphi, when a lecture on "Steels Used in Aero Work" was delivered by Dr. W. H. Hatfield, of the Brown-Firth Research Laboratory, Sheffield.

The lecture was of the greatest interest, and it is inconceivable that anyone in the large audience failed to derive much instruction therefrom. It is, therefore, more the pity that the Flying Services and the Aircraft Industry were so poorly represented. The majority of the audience appeared to consist of people concerned with the steel industry and enthusiastic youngsters of the draughtsman type. Aeroplane and aero-engine constructors were conspicuous by their almost entire absence.

Sir Charles Parsons, of turbine fame, occupied the chair.

Dr. Hatfield said that he did not propose to read his somewhat lengthy paper, but would make running comments upon a series of micro-slides and other pictures.

The lecturer then showed in tabular form the various steels commonly used in aeroplanes and in aero-engines. He laid emphasis upon the need for the use of pure steels for aero work and explained how the presence of foreign matter such as sulphur and slag, in appreciable quantities, creates the danger of failure under stress. He also called attention to the absolute necessity for steels to be properly "soaked" (i.e., heated up slowly and uniformly) before working.

Dr. Hatfield went on to describe the principles involved in steel making, and referred to wrought iron as the nearest practical substance to pure iron as a standard with which to compare the various steels.

He then showed an extremely ingenious diagram which indicated the relation of different degrees of temperature and percentages of carbon with the variation of the point where the pearlite breaks down into a homogeneous mixture of carbon and iron in solid solution. As carbon was added, the critical temperature fell in inverse proportion, dropping to 700 deg. C. with 0.9 per cent. of carbon, which might be regarded as an ideal steel, as it constituted a perfectly uniform steel.

Dr. Hatfield touched upon the composition and properties of various other steels, including 25 per cent. nickel steel, which had the peculiarity of possessing no critical temperature, but was homogeneous at any degree of heat.

The lecturer then pointed out the difference between normal, annealed and tempered steels of similar composition. Returning to carbon steel, he stated that when carbon was added above 0.9 per cent. the excess carbon formed a separate structure known as carbide.

Dr. Hatfield showed the peculiar effects on steel caused by the heat involved in welding, and expressed the opinion that welding should never be done in any part which underwent stress, because the heat frequently changed the structure of the steel in the immediate neighbourhood of the weld into something quite different. Besides this there was the danger of the metal oxidising, with the resultant formation of a pocket of scale in the join, which naturally took away much of its strength.

THE DISCUSSION.

Various leading authorities in the steel world were invited to join in the discussion, but, as in some instances, their faces were unfamiliar to the writer of these notes, and as the chairman called upon them "in accents low and sweet," it is just possible that the names given hereafter may be inaccurate in one or two instances. Incidentally, it occurs to one that the services of a "toast-master" might be a distinct acquisition at meetings of learned societies as an assistant to the chairman.

Dr. Carpenter stated that special steels for aircraft work were quite useless unless they were used with a knowledge of heat treatment and of the effects caused by heating them above their various critical temperatures. He thought that aircraft workers were peculiarly favoured as regards the heat-treatment of metals, because the parts were invariably of small size and lent themselves to tempering, annealing and so forth with ease.

Nevertheless, the conditions under which steels had to work in aircraft, particularly in engines, were extremely severe, and he thought that aircraft engineers had been wonderfully successful, when everything was taken into consideration. Nevertheless, the applications of metals to aircraft had not by any means attained finality.

For instance, pistons were made from such widely divergent materials as cast-iron, cast-steel, aluminium alloys and chrome nickel steel. He had a very poor opinion of the reliability of 25 per cent. nickel steel, despite its constant solid solution.

Mr. Henry Fowler, Superintendent Royal Aircraft Factory, said that the subject of steel interested him immensely, and he hoped that certain impact tests, which were being made by Professor Dalby at the R.A.F., would be productive of good results. Aluminium alloy pistons were giving extremely satisfactory results in aero-engines. He wanted to know more about the metallurgical properties of the steels used in Rafwires.

[So would very many other people, and one is glad to see Mr. Fowler's quest for greater knowledge.—Ed.]

Colonel Bagnall-Wild, in response to a remark made to the contrary by the lecturer, said that in his experience the yield points and elastic limits of steels could readily be determined, and ought to be included in specifications issued to manufacturers. He had found that impact and brittleness were not related, although a part which had failed usually had a poor impact figure.

Col. Bagnall Wild stated that he had been accused of asserting that five steels would cover every requirement experienced in aircraft construction. As a matter of fact, he said that five steels would cover 80 per cent. of the tonnage of steel used in aircraft work. The five varieties were:—0.15 per cent. case hardening, 0.3 per cent. case hardening, 0.4 per cent. case hardening, 0.3 per cent. nickel steel and 0.3 per cent. nickel chrome steel. He would have liked to have heard more about steel tubes, a subject of vital importance to the aircraft constructor.

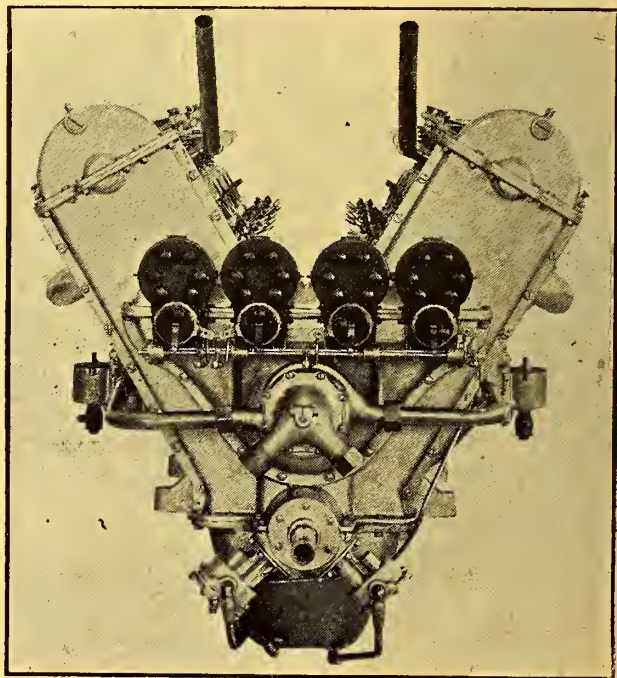
Dr. Rosenhain laid stress upon the importance of using scientifically prepared steels. He said that foreign silicate of iron was dangerous in steel. This did not apply to silicon, which was part of the actual composition. He felt sure that insufficient attention was paid to the actual temperature of steel under test in furnaces and deprecated the custom of assuming that the temperature of steel in a furnace was that of the furnace itself, and recommended the determination of the temperature of the steel under test by the incorporation of thermocouples in pieces of steel of size and shape similar to that under test, placed in various positions in the furnace.

He deprecated the use of welds in members which underwent stress, and could cite instances where loss of life had definitely been caused through failure of welds in aircraft construction. One great danger was the peculiar property of steel in becoming brittle just before it reached its critical temperature, and for this reason a weakness might develop a short distance from the actual root of a weld, and, not infrequently, failure was experienced in this manner right away from the joint itself, which was naturally re-inforced by the metal built up round it.

A gentleman, whose name it was impossible to ascertain, spoke of the need for closer co-operation between engineers and metallurgists. He felt that Dr. Hatfield's lecture had been something of an attack upon the ignorance of engineers regarding metallurgy. He thought, however, that there was room for the metallurgist to learn something from the engineer, and suggested that research should be made into the structures of steel under working conditions, as when employed in the internal combustion engine under the influence of shock and heat.

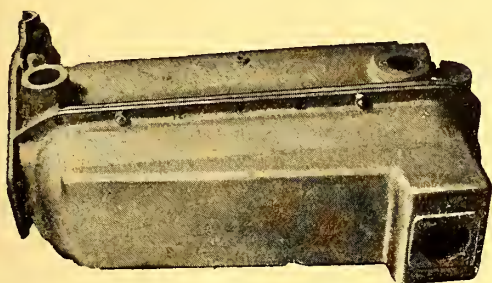
Mr. Dickinson felt that too much reliance should not be placed upon the microscope for determining the structure and properties of steels, and showed one or two micro-slides of steel of identical appearance, which presented widely different properties.

Dr. Hatfield elucidated various points raised by the different speakers, but owing to the lateness of the hour was quite unable to discuss the many questions raised.—W. L. W.



End View of the New Wisconsin Engine, showing the four magnetos, the water circulation and oil pumps, and the casings of the overhead valve-gears.

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in spite of cracked cylinders, smashed gearboxes, or any other form of casualty in any metal part of any aeroplane, car, power plant, automatic or other machine. Simply send the smash to

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THE PATENTS INDEX.

The subjoined index of recent inventions has been specially compiled by THE AEROPLANE from the current Official Patent Records.

PATENT APPLICATIONS.

- Back, W. E. Flying machine. No. 4842/17. April 4th.
 Sayers, W. B. Aeroplane wings for bi- and multi-planes, and fairing and streamlining of adjacent members of aeroplanes and airships. No. 4904/17. April 5th.
 Soames, A. Means for indicating vertical of aircraft. No. 4857/17. April 4th.
 Batchelor, F. A. Apparatus for use on aircraft. No. 5234/17. April 13th.
 Craven, P. P. Machines for flying. No. 5077/17. April 11th.
 Dudd, H. B. Means for applying tape, etc., to wings of aeroplanes, etc. No. 5245/17. April 13th.
 Ellor, J. E. Aero engines. No. 5029/17. April 10th.
 Kelly, T. D. Struts or supports for aeroplanes, etc. No. 5103/17. April 11th.
 Lowes, T. T. Aeroplanes. No. 5287/17. April 14th.
 McWilliam, A. Airship. No. 5205/17. April 13th.
 Newbold, W. J. Temporary holder or clamp for high-tension dead-length-wire bracings in aeroplane wings and fuselages. No. 5204/17. April 13th.
 Norden, C. L. Gyroscopic stabilisers. No. 5221/17. April 13th.
 Sayers, W. B. Aeroplanes. No. 5288/17. April 14th.
 Schmit, A. G. J. Stretchers for iron wires, cables, chains and cords for aeroplanes, etc. No. 5011/17. April 10th.
 Thompson, W. P. Flying machines. No. 5002/17. April 10th.
 Vickers Ltd., and others. Tail skids or runners of aeroplanes. No. 5066/17. April 10th.

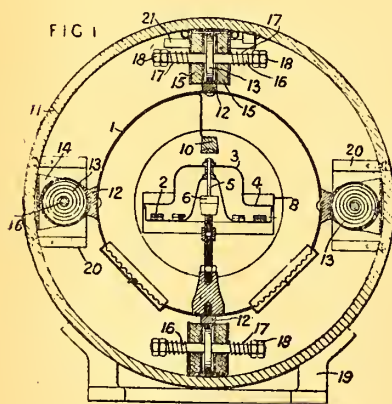
COMPLETE SPECIFICATIONS ACCEPTED, PRINTED COPIES OF WHICH ARE OBTAINABLE ON AND AFTER MAY 3RD, 1917.

- 105,095. March 27th, 1916. Lamplough, F. Internal combustion engines.
 105,249. March 23rd, 1916. Laporte, L. L. Device for combined support and propulsion.
 105,274. May 4th, 1916. Huck, J. R. Airship.
 105,280. June 5th, 1916. Woodward, C. D. Apparatus for indicating the direction of travel of an aeroplane or other moving body by the sun.

RECENT ABRIDGMENTS OF PUBLISHED SPECIFICATIONS.

- 17736/15. **Magnetic Compasses.** OSBORNE, F. O. CREACH-HUGHES, A. J., and HUGHES and SON, H.

A magnetic compass, more particularly for use on aircraft or marine vessels, comprises a dome-shaped float having a magnetic system the mass of which is substantially equally distributed around it, and a bowl approximately of barrel shape and such as to provide an approximately equal space on all sides of the float. As shown in Fig. 1, the float has a dome



3 and an annular portion 4 carrying a vertically graduated card 8 round its periphery. The float has eight flat needles 2 arranged around it and is supported by a pivot 5 in a cup 6, a stop 10 preventing the pivot from leaving the cup. The bowl 1 has a window at one or both ends, and vibration is damped by providing it with four lugs 12, each containing a spiral spring 13. The lugs 12 are held within brackets 14 mounted on a supporting-ring 11 and contain felt washers 15, the lugs and washers being held together by rods 16 carrying springs 17, adjustable by nuts 18. A block 19 may be secured to the ring 11, either above or below the bowl, or at either side of it, so that the compass may be secured to a horizontal or vertical surface. Semi-circular error is corrected by wire magnets housed in four brass tubes 21 disposed to form a rectangle, and soft-iron tubes 20 each in two adjustable parts are provided round opposite brackets 14 to correct quadrantal error and assist in controlling the card during turning movements. On marine vessels, the ring 11 may be supported in gimbals, which may comprise a yoke mounted to turn about a horizontal axis in bearings carried by a bracket, the arms of the yoke having bearings for trunnions carried by the ring 11.

103,789. **Propellers; aircraft and like framework.** COIR TYRE Co. and ROSE, G. D.

Propellers, propeller blades, and parts of aircraft and hydroplanes, such as the frames or spars, are formed of a coir fabric or base composed wholly or mainly of coir yarn impregnated or combined with rubber or other adhesive material, compressed, consolidated, and moulded into shape and vulcanised. The coir fabric is prepared substantially in the manner described in Specification 10688/15, which describes the manufacture of discs or washers from layers of impregnated coir fabric.

MARKET REPORTS.

Prices given are for quantities on the usual terms.

April 19th, 1917.

COPPER.—There has been no important alteration whatever, and there is very little possibility of a change at present. There are reasonable prospects of more substantial supplies of Copper from America now that war has been declared.

Current Prices:—Standard Copper—Cash terms, £136; average Feb., £138; average 1916, £116.

Copper sheets, £174. Copper Tube S.D., 21d. per lb. Brass Sheets, 24 gauge, 16 5-8d. per lb. Brass Tube, 17½d. per lb.

STEEL.—It is expected that with more shipping from America the supplies of American billets will be considerably increased; at the same time, the prices demanded are far in advance of the English prices, the latter being approximately 25 per cent. lower than the average American prices. Although the increase of supplies from U.S.A. will not directly affect aircraft steels, it should certainly have an indirect effect on the output of billets for the latter. The tendency of English prices is upward, and there is a great scarcity of sheet steel, consequently prices are advancing.

Current Average Prices:—R.A.F. 3A Steel, 36s. per cwt. basis. R.A.F. 1E Steel, 78s. per cwt. basis. R.A.F. 9A Sheet Steel, 29s. to 32s. per cwt. basis.

ALUMINIUM.—There has been no alterations either in prices or in the regulations governing the control of this metal.

Official Prices:—Ingots, £225. Remelted, £210. Aluminium Sheet, 19 G., 2s. 10½d. per lb.

TIMBER.—There is very little Silver Spruce being offered, and the position is worse than ever. The tendency of prices is still upward, and although it is possible to buy at 13s. 6d., several merchants are asking 15s. Admiralty shipments are anxiously awaited, but dealers are very pessimistic. Walnut is very scarce, and, as foreshadowed in my previous reports, the demand for Mahogany is inflating prices for this wood.

Current Prices:—Silver Spruce, 14s. to 15s. English Ash, 12s. to 13s. Walnut, 2s. 7d. s.f. Plank. Mahogany, 2s. 1d. to 2s. 3d. s.f. Plank. Prices are for selection and delivery.

FABRIC.—Manufacturers are still waiting for prices to be fixed by the Air Board.

There are good supplies of 17C Fabric and Spaced Fabric available, and it is difficult to see what good purpose the official control of this material is likely to serve. It is doubtful whether prices would have risen 6d. per yard since October, 1916, if the market had been left open to competition.

Average Prices:—October, 1915, 20d. per yd.; January, 1916, 21d. per yd.; June, 1916, 23½d. per yd.; October, 1916, 23½d. per yd. All 36 in. wide.

LATER.—The Copper market is a little easier. This may not be directly attributable to the patriotic action of American merchants, but it is expected that the position in America will shortly have a favourable influence upon the crisis here.

Latest Prices:—Ingot, £133; sheet, £170 per ton.

TO ADMIRERS OF THE SALMSON ENGINE.

Though it is not permissible to publish any details as yet, the admirers, who are many, of the Salmson (Canton-Unné) engine will be glad to hear that the firm's latest product bids fair to put it again in the very front rank of aeroplane engines as regards popularity. The power of the new engine is high enough to make it acceptable for the speediest machines, and its weight with everything on allows it to compete even with rotary engines. The short overall length certainly has its advantages in small high speed machines where longitudinal moments of inertia are of more importance than in the bigger machines. Apparently one of the chief troubles of the Salmson, that which afflicts the Stores' Officer who has to deal with spare parts, has been overcome, and the whole engine is a very handsome job and well worth the attention of aeroplane designers.

The Dudbridge Iron Works, Ltd., of Stroud, are, presumably, as usual, handling the engine in this country, and the London representative, Mr. O. Paul Monckton, of 87, Victoria Street, S.W.1, will doubtless be glad to give all possible information about it to those who are qualified to receive it.

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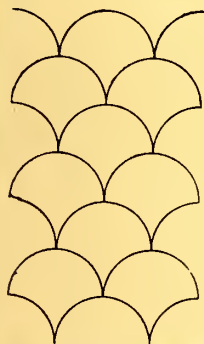
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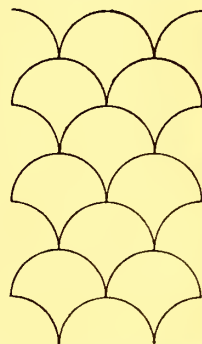
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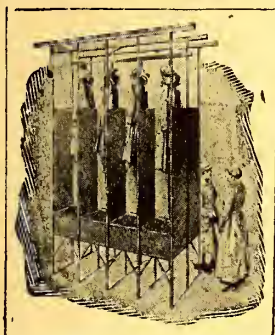
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British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol.

British Caudron Co., Ltd., Broadway, Cricklewood, N.

Canute Airplane Co., Royal Pier Gate, Southampton.

Central Aircraft Co., Palmerston Works, High Rd., Kilburn, N.W.

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Davidson Aviation Co., Ltd., Hammersmith, W.

Eastbourne Aviation Co., Ltd., Eastbourne

Grahame-White Aviation Co., Ltd., London Aerodrome

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Worms Aircraft Construction Co., Twickenham

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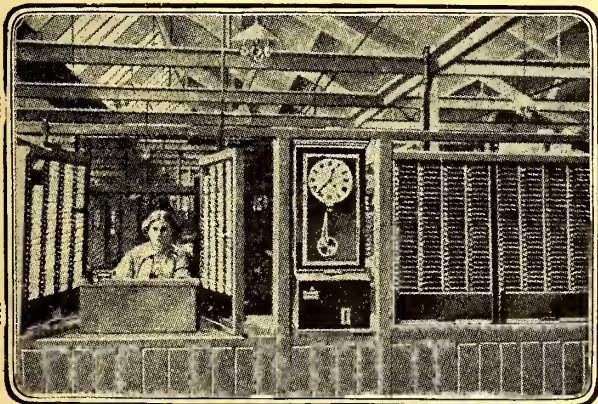
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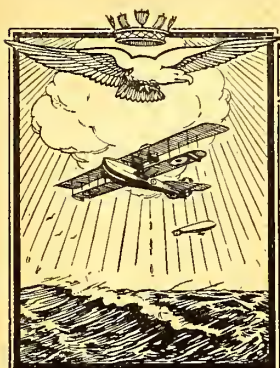


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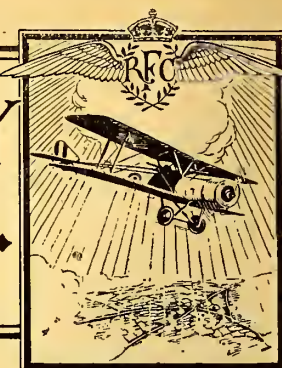
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ADMIRALTY, April 12th.
R.N.A.S.—Actg. Flt. Comdr. to be temp. Flt. Comdr.—B.C. Bell, March 31st.

WAR OFFICE, April 17th.
REGULAR FORCES.—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Flt. Comdr.—Capt. H. Colmore, 7th Hrs., March 11th. Park Comdr.—Capt. (temp. Maj.) the Hon. E. A. Stonor, R.F.C., Spec. Res., from an Equipment Officer, 1st Cl., and to retain his temp. rank whilst so emplyd., April 4th.

Equipment Officers, 1st Cl.—Sec. Lt. P. R. Burchall, Spec. Res., from the 3rd Cl., and to be temp. Capt. whilst so emplyd., Jan 31st. 2nd Cl.—Lt. F. G. M. Williams, Spec. Res., from the 3rd Cl., Feb. 23rd. Lt. R. Scott, Spec. Res., from the 3rd Cl., March 22nd. 3rd Cl.—Temp. Sec. Lt. G. Baillie, Gen. List, Dec. 31st, 1916. Capt. A. L. Gregory, M.C., 3rd Dorset Regt., Spec. Res., and to be secd., March 28th.

The King has been pleased to confer the Military Cross on the following Officers in recognition of their gallantry and devotion to duty in the field:—

Lt. Thomas Gerald Glynn Bolitho, R.F.C., Spec. Res.—When his balloon was attacked by a hostile aeroplane he saw his observer safely out, and then descended by parachute himself. He has at all times set a fine example, and has done much to preserve a high standard of efficiency in his section.

Sec. Lt. (temp. Lt.) Charles Elliot Denning, R.W. Surrey Regt., Spec. Res., and R.F.C.—When acting as escort to a reconnaissance machine, he attacked a hostile machine and succeeded in forcing it to land. Later, he landed beside the hostile machine which was on fire, and extinguished the fire.

Sec. Lt. (temp. Lt.) Osbert Richmond Knight, R.W. Surrey Regt. and R.F.C.—When attacked by two hostile machines, although wounded, he succeeded in driving the two machines away, and continued to observe for his battery. Later, he again drove off an enemy machine and continued his observation.

Sec. Lt. (temp. Capt.) James Leith Leith, Hampshire Regt. and R.F.C.—When leading a formation of five machines he drove down one of 11 hostile scouts which attacked his patrol. He completed his reconnaissance and, although again attacked, succeeded in leading his patrol safely back to our lines. On previous occasions he has brought down three hostile machines.

Lt. William Geoffrey Meggitt, Welsh Regt., Spec. Res., and R.F.C.—While one of the patrol engaging five hostile machines, he drove down one enemy machine and then attacked another, which was seen to go down vertically. He has previously brought down three hostile machines.

Temp. Sec. Lt. George Kenneth Simpson, R.F.C., late R.G.A., Gen. List.—While observing from a balloon which was set on fire, he went to the assistance of his fellow-observer, and would not leave the balloon himself until he had seen the other observer clear. He was severely burnt.

The King has been pleased to award the Military Medal for bravery in the field to the following man:—

Po. 578 (S.) Pte. J. Collinson, R.M.L.I., attd. R.F.C.

With reference to the awards of Meritorious Service Medals, published in "Gazette" of 12th ultimo, the following name should have appeared under the heading "for gallantry in the performance of military duty," not for "service rendered with the Armies in the field during the present war."

Officers in charge of Records will accordingly make the necessary correction in their records.

"Gazette" dated March 12th, 1917.—Delete 20943 1st Cl. Air Mech. T. P. Watson, R.F.C. (Meritorious Service Medal gazetted Jan. 24, 1917).

WHITEHALL, April 14th.

The King was pleased, on Wednesday, Feb. 21st last, to confer the honour of Knighthood upon the undermentioned gentleman at Buckingham Palace:—

William Weir, Esq. (To take effect as from Feb. 21st, 1917.)

WAR OFFICE, April 18th.
REGULAR FORCES.—ESTABLISHMENTS.—SCHOOLS OF INSTR.—SCHOOL OF AERIAL GUNNERY.—Comdt.—(Graded as a Wing Comdr.)—Maj. (Bt. Lt.-Col.) E. B. Gordon, D.S.O., North'd Fus., vice Capt. (temp. Lt.-Col.) L. A. Strange, M.C., Dorset Regt., April 1st.

WAR OFFICE, April 19th.
REGULAR FORCES.—STAFF.—Following temp. appt. is made at the War Office:—

Staff Lt.—Temp. Capt. L. S. B. Hull, R. W. Surr. R., T.F., from a Balloon Co. Comdr. (graded as a Flt. Comdr.), R.F.C., vice temp. Lt. (temp. Capt.) W. J. C. Brown, Gen. List, March 15th.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Flt. Comdrs.—From Flying Officers, and to be temp. Capt. whilst so emplyd.:—Temp. Lt. F. G. Saunders, Gen. List, March 27th. Sec. Lt. J. D. Stodart, Spec. Res., April 1st. Temp. Lt. E. L. Williams, Gen. List, April 3rd. From Flying Officers:—Capt. R. Oxspring, M.C., Yorks L.I., Spec. Res.; Capt. D. R. Gawler, R. Scots., Spec. Res., April 6th. From Flying Officers and to be temp. Capt. whilst so emplyd.:—Temp. Lt. M. L. Taylor, Gen. List; Sec. Lt. H. R. Harker, Spec. Res., April 6th. Sec. Lt. H. G. White, E. Kent R., April 11th.

Adjts.—Lt. R. L. Kennedy, Hrs., and to be secd., March 6th. Sec. Lt. K. H. Marshall, Lond. R., T.F., to be secd., and to be temp. Lt. whilst so emplyd., vice temp. Lt. R. Addenbrooke-Prout, Gen. List, March 11th. Capt. S. C. Raffles, R.W., Spec. Res., from a Balloon Officer, vice Capt. J. W. Cruikshank, 3rd Durh. L.I., Spec. Res., April 3rd.

Park Comdr.—Capt. J. W. Cruikshank, Durh. L.I., Spec. Res., from an Adj., and to be temp. Maj. whilst so emplyd., April 3rd.

Equipment Officers, 1st Cl.—Sec. Lt. H. F. Anns, Lond. R., T.F., from a Staff Lt., and to be temp. Capt. whilst so emplyd., March 15th.

SCHOOLS OF INSTRUCTION.—Group Gunnery and Armament Instr.—(Graded as an Equipment Officer, 1st Cl.)—Capt. H. E. F. Wyncoll, M.C., Notts and Derby R., a Flying Officer (Observer), March 6th.

SCHOOL FOR WIRELESS OPERATORS.—Comdt.—(Graded as a Park Comdr.)—Capt. J. B. Bowen, Yeo., T.F., an Equipment Officer, 1st Cl., and to be temp. Maj. whilst so emplyd., March 23rd.

Instr.—(Graded as an Equipment Officer, 2nd Cl.)—Temp. Sec. Lt. R. Cook, Gen. List, an Equipment Officer, 3rd Cl., and to be temp. Lt. whilst so emplyd., March 23rd.

WAR OFFICE, April 20th.
REGULAR FORCES.—The following N.C.O. to be temp. Sec. Lt.:—

MEMORANDUM.—For duty with the R.F.C.—Sergt. T. K. Breakell, from R.F.C., March 19th.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Wing Comdr.—Maj. A. C. E. Marsh, R.A., from a Sqdn. Comdr., and to be temp. Lt.-Col. whilst so emplyd., March 6th.

Flt. Comdrs.—From Flying Officers.—Temp. Sec. Lt. H. C. Todd, Gen. List, and to be temp. Capt. whilst so emplyd., April 3rd. Temp. Capt. E. F. Elderton, Gen. List, April 5th.

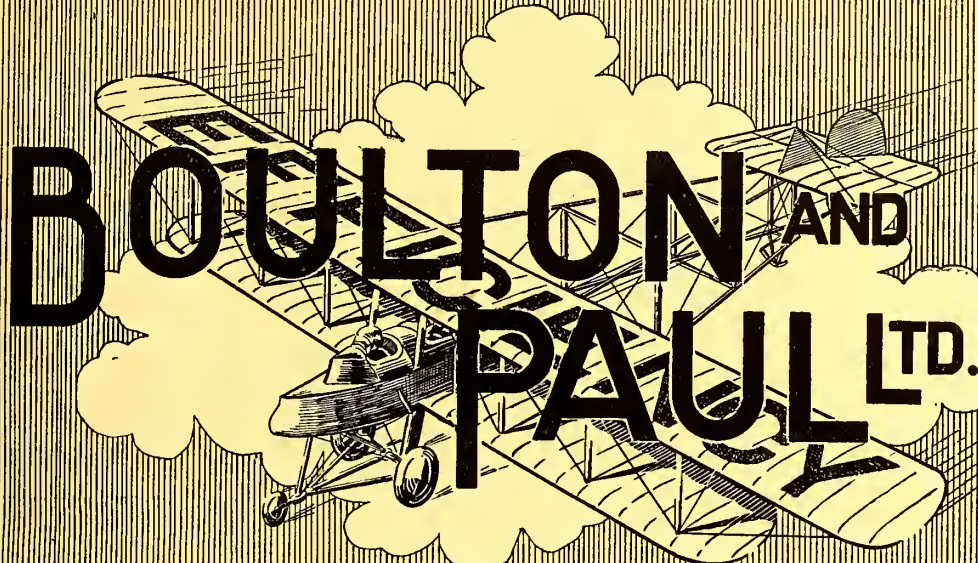
Equip. Officer, 1st Cl.—Sec. Lt. (temp. Capt.) E. E. Robb, S.R., from the 2nd Cl., and to retain his temp. rank whilst so emplyd., March 6th. 2nd Cl.—From 3rd Cl.—Lt. J. Armes, S.R.; Sec. Lt. A. Hingston, S.R., and to be temp. Lt. whilst so emplyd., March 6th. Sec. Lt. L. R. Kerridge, S.R., from a Flying Officer, and to be temp. Lt. whilst so emplyd., March 30th. 3rd Cl.—Temp. Sec. Lt. W. M. Arnot, Gen. List; temp. Sec. Lt. K. S. Hughes, Gen. List, March 20th.

ADMIRALTY, April 22nd.

The King has been pleased to give orders for the appointment of the following Officer:—

TELEGRAMS "AVIATION" NORWICH.

PHONE N° 851 NORWICH

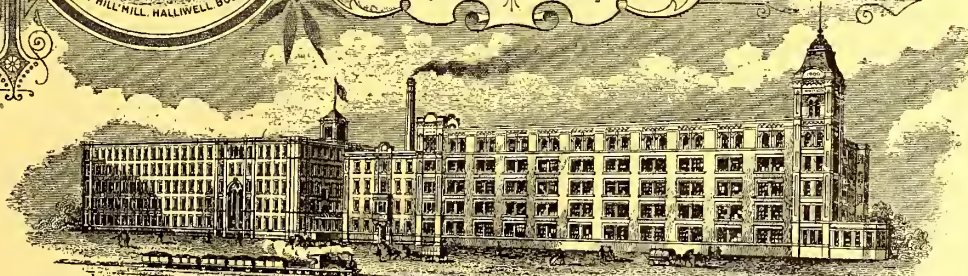


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KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.

TO BE A COMPANION OF THE DISTINGUISHED SERVICE ORDER.—

Flt. Lt. (actg. Flt. Comdr.) Bertram Charles Bell, R.N.A.S.

For conspicuous bravery and skill in attacking hostile aircraft. Since Feb. 1st, 1917, he has taken part in 14 aerial combats, notably:—

On March 17th, 1917, on two different occasions during the same offensive patrol he attacked and drove down hostile machines, one completely out of control and the other in flames.

On March 24th, 1917, he attacked a hostile machine which was diving on one of our machines. After he had fired about 30 rounds at a range of about 50 yards the hostile pilot fell back and his machine went down spinning and side-slipping completely out of control.

* * *

The King has also been pleased to approve of the award of the Distinguished Service Cross to the following Officers:—

Flt. Lt. (now actg. Flt. Comdr.) Charles Cyril Rogers Edwards, R.N.A.S.

Sub-Lt. Charles Keith Chase, R.N.V.R.

In recognition of their services on March 1st, 1917, when they were attacked by two hostile machines whilst on a reconnaissance flight and brought them both down out of control. Flt. Lt. Edwards was hit by a bullet which passed through the left shoulder, fracturing the collar bone, and at the same time was slightly wounded in both feet. Although suffering considerably, he brought his machine home safely, in spite of being again attacked by two hostile aircraft. By his determination and pluck he probably saved his own life and that of his observer.

Flt. Comdr. Alfred William Clemson, R.N.A.S.

Sub-Lt. James Leslie Kerry, R.N.V.R.

In recognition of their conspicuous gallantry, on Feb. 28th, 1917, when they carried out a reconnaissance of Rayak and Damascus in a seaplane. During this flight they crossed two mountain ranges whose lowest ridges are 4,000 ft. high, and brought back valuable information.

Lt. (now Lt.-Comdr.) Erskine Childers, R.N.V.R.

In recognition of his services with the R.N.A.S. for the period Jan.-May, 1916. During this time he acted as observer in many important air reconnaissances, showing remarkable aptitude for observing and for collating the results of his observation.

Flt. Sub-Lt. Horace Ernest Philip Wigglesworth, R.N.A.S.

For conspicuous gallantry and enterprise on Jan. 23rd, 1917, during a bomb attack by aircraft when considerable damage was done to enemy blast furnaces at Burbach. During this flight he fought five engagements with enemy aircraft in formations of three, four, and five at a time.

Sub-Lt. (now Lt.) Eric Bourne Coulter Betts, R.N.V.R.

In recognition of his services on Feb. 1st, 1917, when he carried out a long reconnaissance and returned with extremely important information, shooting down an enemy scout machine which attacked him on his way back.

* * *

The following awards have also been approved:—

TO RECEIVE THE DISTINGUISHED SERVICE MEDAL:—

Actg. Air Mech., 1st Grade, Walter Bunce, O.N. F.7088.

The following officer has been mentioned in Despatches:—

Flt. Lt. Henry Guy Holden, R.N.A.S.

* * *

The following decorations have been conferred by the Allied Powers on officers and men of the British Naval Forces for distinguished services rendered during the war:—

CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.
THE LEGION OF HONOUR.

Officer.—Capt. William L. Elder, R.N. (Wing Capt., R.N.A.S.)

Chevalier.—Wing Comdr. Richard B. Davies, V.C., D.S.O., R.N.

THE CROIX DE GUERRE.

Flt. Sub-Lt. Horace E. P. Wigglesworth, R.N.A.S.; Flt. Sub-Lt. Fred C. Armstrong, R.N.A.S.; Flt. Sub-Lt. Ronald F. Redpath, R.N.A.S.; Flt. Sub-Lt. Percy G. McNeil, R.N.A.S.; Flt. Sub-Lt. Raymond Collishaw, R.N.A.S.

Air Mech., 1st Cl., Sydney Herbert Pinchen, O.N.F.2932.

The King has given unrestricted permission to the Officers and men concerned to wear the Decorations in question.

FROM THE COURT CIRCULAR.

WINDSOR CASTLE, April 19th.

The King and Queen, attended by Colonel the Maharaja of Bikaner and Captain B. Godfrey-Faussett, R.N., visited the works of the Sopwith Aviation Company to-day.

NAVAL.

ADMIRALTY COMMUNIQUÉ.

APRIL 23rd.—One of H.M. airships left on patrol from an East Coast Air Station on the morning of the 21st inst., and has not returned.

Reports received state that an airship was seen to descend

in flames in the Straits of Dover about noon the same day. An aeroplane or seaplane was seen in the vicinity shortly before the occurrence, and it is believed that the missing British airship has been destroyed by hostile aircraft.

The position given is a considerable distance from the area in which the airship should have been working, and it is probable that her engine power had failed and that she had drifted a long distance with the wind.

Extensive search has been made where she fell, but no trace of the crew nor any portion of the ship has been found, and it must be assumed that all the crew are lost. The relatives have been informed.

[It would be of interest to know what equipment of parachutes and lifebelts the crew possessed.—Ed.]

* * *

The following appointments have been made in the Royal Naval Air Service:—

APRIL 17th.—Act. Flt. Commr. (temp.)—E. C. Bell, confirmed in rank of Flt. Commr. (temp.), seny. March 31st.

APRIL 20th.—Flt. Comdr.—F. A. Brook, promoted to Actg. Wing Comdr. (temp.), seny. April 16th.

Flt. Lt.—C. E. Wood, apptd. Act. Flt. Comdr., seny. April 17th.

APRIL 23rd.—Temp. Actg. Lt. (temp. Flt. Lt.) L. D. Morrison promoted to temp. Lt., with seny. April 6th.

* * *

THE CASUALTY LIST.

Reported April 18th.

ACCIDENTALLY KILLED.—Titcomb, Prob. Flt. Officer Francis H. Y., R.N.

Reported April 19th.

ACCIDENTLY KILLED.—Lavigne, Probationary Flt. Officer Joseph L., R.N.

WOUNDED.—Cripps, D., Ldg. Mech., F.176.

Reported April 23rd.

KILLED.—Masson, Flt. Sub-Lt. Donald H., R.N.

Wade, Warrant Telegraphist Jack, R.N.R.

ACCIDENTALLY INJURED.—Kermode, Probationary Flt. Sub-Lt. Alfred C., R.N.

Reported April 24th.

ACCIDENTALLY INJURED.—Munday, Flt. Sub-Lt. Albert H., R.N.
Emerson, Flt. Officer Guy M., R.N.

PERSONAL NOTICES.

DEATHS.

MACKENZIE.—Definite information has reached the parents of Flt. Comdr. Colin Mackenzie, R.N., D.S.O., at Bath, which shows that he was killed in Jan. last, when reported missing by the Admiralty. The communication received is based on information supplied by the German air service, which states that the British aviator was buried at Achiet-le-Grand, near Bapaume. Flt. Comdr. Mackenzie won the D.S.O. and a French decoration last year for daring and skill.

* * *

PETRE.—Act. Squadron Commander John Joseph Petre, D.S.C., R.N., to whose death reference was made last week, was it appears killed in an aeroplane accident in France on April 13th. He was born on April 11th, 1894, and, before going to Stoneyhurst, was educated at Mount St. Mary's College, Chesterfield. Besides taking part in various raids from Dunkirk on the Belgian coast, he commanded a squadron on the Somme during last summer in co-operation with the R.F.C.

In October, 1916, he was awarded the Croix de Guerre by the French Government for bringing down a German aeroplane, and had already been awarded the D.S.C. in June, 1916. He took his pilot's certificate in October, 1914, and went to France in February, 1915, where he had been constantly on active service ever since, except for short spells of leave. His death is very deeply regretted by all who knew him.

MARRIAGE.

BARR—BRUCE.—On April 8th, at St. Martin's, London, Flt. Lt. F. M. L. Barr, R.N.A.S., eldest son of Engineer Capt. E. Barr, R.N., and Mrs. Barr, was married to Doris Bruce, daughter of Mr. and Mrs. J. Bruce, Westcliff-on-Sea.

MILITARY.

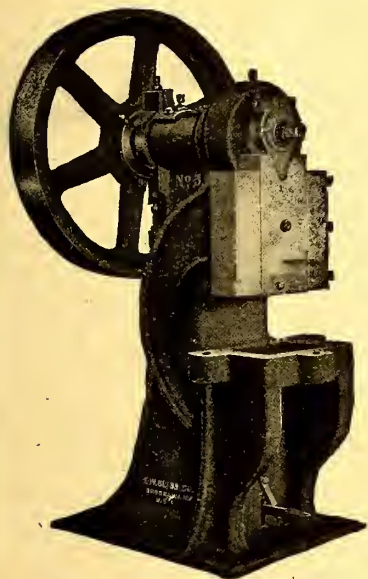
G.H.Q. COMMUNIQUÉS.

APRIL 17th, 8.58 p.m.—In spite of exceedingly unfavourable weather much useful work was carried out by our aeroplanes yesterday. Three German machines were driven down damaged in air fighting, but in most cases the enemy avoided combat.

Five of our machines are missing.

APRIL 18th, 8.42 p.m.—In the course of a bombing expedition carried out last night our aeroplanes obtained hits upon an enemy train, two hostile columns of mechanical transport, and a German transport park. Great damage was observed to have been done in each case.

APRIL 21st, 12.10 p.m.—Somewhat improved weather enabled our aeroplanes to carry out useful work yesterday.



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LONDON OFFICE: 60 Watling Street, E.C.

One hostile machine was brought down in air fighting. Two of our machines have not returned.

APRIL 22nd, 9.46 a.m.—There was considerable activity in the air yesterday and much air fighting, in which four German machines were brought down and six driven down out of control.

In addition to the above a hostile machine was shot down by our anti-aircraft guns.

Four of our aeroplanes are missing.

APRIL 23rd.—There was great activity in the air yesterday, in which our aircraft were entirely successful.

In air fighting six German aeroplanes were brought down crashed and 15 others were driven down out of control. In one engagement a hostile formation of eight machines was attacked by two of our aeroplanes, which brought down two hostile machines and drove a third out of control.

Besides those destroyed in air fighting one German aeroplane was shot down by our anti-aircraft guns.

In addition seven German kite-balloons were destroyed by us yesterday.

Four of our machines are missing.

WAR OFFICE COMMUNIQUÉS.

The General Officer commanding the British Forces in Macedonia, reports:—

APRIL 20th.—During the week . . . Our aircraft bombed an enemy aerodrome, setting fire to a hangar and causing other damage.

The General Officer Commanding the British Forces in Mesopotamia reports:—

APRIL 23rd.—As the result of an air fight on the 22nd a new Halberstadt was brought down, the pilot, who was the enemy's Flying Corps Commander, being killed and the machine falling into our hands.

CASUALTY LIST.

Reported April 18th.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—

Fisher, Sec. Lt. A. J., R.F.C.

Hele-Shaw, Lt. H. R., R.F.C.

WOUNDED.—Brockman, Sec. Lt. F. G., R.F.C.

Cooper, Sec. Lt. J. H., R.F.C.

Cox, Capt. C. R., R. Sussex Regt., attd. R.F.C.

de Watteville, Sec. Lt. J. E., Cameron Highrs. and R.F.C.

Lindley, Sec. Lt. A., R.F.C.

Morris, Sec. Lt. F. St. V., Sherwood Foresters, attd. R.F.C.

Pattison, Sec. Lt. P. B., Highland L.I., attd. R.F.C.

Pryor, Lt. A. D., Cambridge Regt. and R.F.C.

Saunders, Lt. F. G., R.F.C.

Stafford, Sec. Lt. F. J. E., R.F.C.

Thomas, Lt. J. H., Manchester Regt., attd. R.F.C.

MISSING.—Cantle, Lt. L. H., Yeomanry and R.F.C.

Goodison, Sec. Lt. F. B., S. Staffs. Regt. and R.F.C.

Logan, Sec. Lt. R. A., R.F.C.

Mackenzie, Sec. Lt. K. L., Argyll and Sutherland Highrs., attd. R.F.C.

Owen, Sec. Lt. T. J., R.F.C.

Schreiber, Lt. R. T. B., Suffolk Regt. and R.F.C.

White, Sec. Lt. B. W., Liverpool Regt. attd. R.F.C.

KILLED.—R.F.C.—Quicke, 711 Flt. Sgt. S. H. (East Finchley, N.)

Reported April 19th.

WOUNDED.—Heath, Lt. R. E., Welsh R. and R.F.C.

KILLED.—R.F.C.—Boon, 61782 2nd Cl. Air Mech. J. (Cleethorpes).

Russell, 12708 1st Cl. Air Mech. F. (Rochdale).

WOUNDED.—R.F.C.—Critchley, 3947 Flt. Sgt. E. P. (Birmingham).

Ridgway, 35972 Sgt. J. F. (Liverpool).

Williams, 12384 2nd Cl. Air Mech. W. T. (New Malden).

Reported April 20th.

KILLED.—Ball, Sec. Lt. O. F. G., R.F.C.

Burnand, Sec. Lt. G. C., R.F.C.

Illiss, Lt. M. A. A., R. Irish Regt., attd. R.F.C.

Long, Sec. Lt. C. P., Royal Engineers, attd. R.F.C.

Mackintosh, Sec. Lt. C., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—

Douglas, Sec. Lt. A., R.F.A., attd. R.F.C.

Hugill, Sec. Lt. V. F. H., R. Fusiliers, attd. R.F.C.

Warn, Lt. W. G., R. Sussex Regt., attd. R.F.C.

DIED OF WOUNDS.—Bower, Sec. Lt. F., Northumberland Fus., attd. R.F.C.

Brink, Lt. J. H., R.F.A., attd. R.F.C.

PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF

WOUNDS.—Cox, Capt. C. R., R. Sussex Regt., attd. R.F.C.

WOUNDED.—Curtis, Lt. C., R.F.C.

Derwin, Sec. Lt. E. C. E., R.F.C.

Goudie, Sec. Lt. P. L., R.F.C.

Gunner, Sec. Lt. E. R., R.F.C.

Jacob, Sec. Lt. G. H., R.F.C.

PREVIOUSLY REPORTED MISSING NOW REPORTED WOUNDED.—

Cooper, Sec. Lt. S., R.F.C.

Smyth, Sec. Lt. E. B., R.F.C.

MISSING.—Adeney, Sec. Lt. R. E., R.W. Surrey R., attd. R.F.C.

Baker, Capt. A. F., Duke of Corn. L.I., attd. R.F.C.

Boughton, Sec. Lt. C. B., Welsh Regt., attd. R.F.C.

Brockhurst, Sec. Lt. G. N., R.F.C.

Dunford, Sec. Lt. E. T., R.F.C.

Etches, Sec. Lt. A. J. E., R.F.C.

Holland, Sec. Lt. C. B., R.F.C.

Kitchin, Lt. F. L., Gloucester Regt., attd. R.F.C.

Lovell, Sec. Lt. L. G., R.F.C.

Matthews, Sec. Lt. F., R.F.C.

Roche, Sec. Lt. S., R.F.C.

Tidmarsh, Capt. D. M., M.C., R. Irish Regt., attd. R.F.C.

Reported April 21st.

KILLED.—Long, Sec. Lt. C. P., R.E., attd. R.F.C.

WOUNDED.—Shirley, Capt. F. L. J., Yorkshire R. and R.F.C.

MISSING.—Todd, Lt. A., M.C., Durham L.I., attd. R.F.C.

Walton, Lt. O. T., S. Lancs R. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Daly, Capt. A. P. V., Connaught Rangers, attd. R.F.C.

REPORTED PRISONER IN GERMAN HANDS.—Southon, Capt. H. G., R.F.C.

CORRECTION.—OFFICER MISSING.—Lecker, Sec. Lt. A. N., R.F.C. (reported missing), should read:—Leckler, Sec. Lt. A. N., R.F.C.

Reported April 23rd.

KILLED.—Carter, Sec. Lt. S. R., Lancs. Fus., attd. R.F.C.

Morrison, Sec. Lt. N. W., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Bertie, Capt. C. P., Royal Field Artillery and R.F.C.

Russell, Sec. Lt. P. A., Cameron Highrs. and R.F.C.

WOUNDED.—Baker, Sec. Lt. J. W., R.F.C.

Curling, Sec. Lt. E. T., London Regt. and R.F.C.

Davis, Sec. Lt. H. E., R.F.C.

Lutyens, Lt. A. C., M.C., R.F.A., attd. R.F.C.

Sewell, Lt. R. P., King's Own Scottish Bord. and R.F.C.

Smith, Sec. Lt. R. N., R.F.C.

MISSING.—Bates, Sec. Lt. A. H., R.F.C.

Binnie, Lt. A., R. Scots Fusiliers, attd. R.F.C.

Boyd, Sec. Lt. P. B., Gordon Highrs., attd. R.F.C.

Chapman, Sec. Lt. L. C., R.F.C.

Cock, Sec. Lt. J. H., R.F.C.

Cramb, Sec. Lt. W. B., Argyll and Suth'd Highrs., attd. R.F.C.

Davies, Lt. H. R., R.E., attd. R.F.C.

Davis, Sec. Lt. H., E. Yorks Regt., attd. R.F.C.

Gillespie, Sec. Lt. G. W., Middlesex Regt. and R.F.C.

Green, Lt. W. H., Liverpool Regt. and R.F.C.

Hodgson, Capt. G. B., R.F.C.

Holmes, Lt. C. W. D., Bedford Regt., attd. R.F.C.

Horne, Sec. Lt. H. G. M., London Regt. and R.F.C.

Law, Sec. Lt. E. R., R.F.C.

Maxed, Lt. O. D., E. Kent Regt. and R.F.C.

Margerison, Sec. Lt. T., Cyclist Batt. and R.F.C.

Morris, Lt. C. H., R. Welsh Fus., attd. R.F.C.

Ormerod, Sec. Lt. A., R.F.A., attd. R.F.C.

Pascoe, Sec. Lt. E. J., R.F.C.

Platt, Capt. L. S., Lancers, attd. R.F.C.

Ray, Sec. Lt. P. O., Black Watch, attd. R.F.C.

Richardson, Capt. L. L., R.F.C.

Russell, Lt. W. O., N. Staffs Regt., attd. R.F.C.

Stuart, Capt. J., R. Inniskilling Fus., attd. R.F.C.

Tanfield, Sec. Lt. A. H., R. Warwick Regt., attd. R.F.C.

Topham, Sec. Lt. M., R.F.C.

Watson, Sec. Lt. A., R.F.C.

Wollen, Sec. Lt. D. C., R.F.C.

Wood, Lt. M. H., Lincoln Regt. and R.F.C.

Worsley, Sec. Lt. R. S. L., R.F.C.

CORRECTION.—Glenn, Sec. Lt. W. W., R.F.A., attd. R.F.C. (reported wounded), should read:—Glenn, Sec. Lt. W. W., R.F.A., attd. R.F.C.

ACCIDENTALLY KILLED.—R.F.C.—Rawson, 10096 2nd Cl. Air Mech. E. C. (Geddington).

WOUNDED.—R.F.C.—Clark, 22681 2nd Class Air Mech. H. S. (Oxford).

OVERSEAS FORCES.

MISSING.—Chalk, Lt. W. J., Canadian Inf., attd. R.F.C.

Reported April 24th.

KILLED.—Cowan, Sec. Lt. W. W., R. Scots, attd. R.F.C.

Donaldson, Sec. Lt. C. T. L., Yeomanry and R.F.C.

WOUNDED.—Goudie, Capt. W. G., R.A.M.C., attd. R.F.C.

Walker, Lt. G. C., A.S.C., R.F.C.

MISSING.—Capper, Lt. E. W., Yeomanry and R.F.C.

Harle, Lt. W., Northumberland Fus. and R.F.C.

Samuel, Lt. J. R., Welsh Regt. and R.F.C.

WOUNDED.—SHOCK (SHELL).—R.F.C.—Chesson, 41610, 2nd Cl. Air Mech. C. (Islington, N.).

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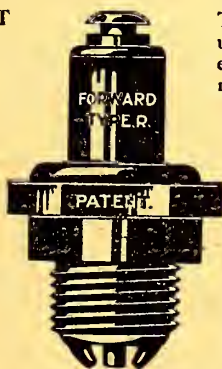
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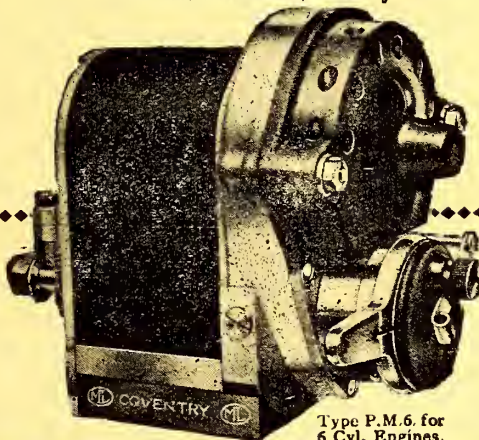
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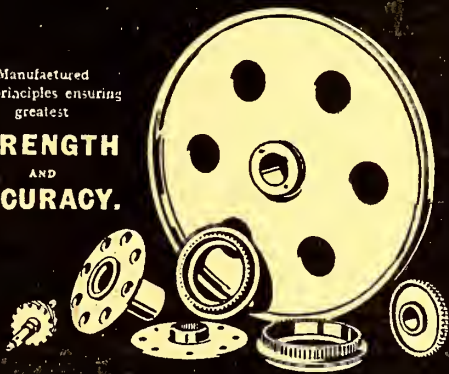


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PERSONAL NOTICES.

DEATHS.

BERTIE.—Capt. Claud Peregrine Bertie, R.F.A. and R.F.C., previously reported missing, now stated to have been killed, was the only son of Lt.-Col. the Hon. George and Mrs. Bertie, of Eccleston Square. Joining the London Brigade of the R.F.A. in 1909, he volunteered for foreign service on the outbreak of war. Invalided home, he joined the R.F.C.

* * *

BURNAND.—Geoffrey Chasmore Burnand, R.F.C., killed in action on April 7th, was the only son of the late Graham Burnand, of Worth, Sussex, and of Mrs. Burnand, of Doneraile, Co. Cork, Ireland, aged 34.

* * *

BURNS.—Lt. Alexander Burns, R.F.C., was making an ascent on the South Coast on April 20th, when he appeared to lose control of the machine, which nose-dived to earth. He was still alive, though badly injured, when picked up, but died after his removal to hospital.

* * *

CARTER.—Sec. Lt. Seton Rodney Carter, Lan. Fus., attd. R.F.C., killed in action on April 14th, was the only son of Mrs. Dot Synnot Tinkler, 105, Kingsbury Road, Erdington, and was in his 22nd year.

* * *

COLLINS.—Sec. Lt. Arthur Duppa Collins, R.F.C., was the only son of the late Mr. W. P. Collins, of Beckenham, and Mrs. Collins, of 10, Lingfield Avenue, Kingston-on-Thames. Educated at Seafields, Bexhill-on-Sea, and Eastbourne College, he joined the staff of the P. and O. Co. in London. In Jan., 1915, he enlisted in the Artists' Rifles, and went to France. He obtained his commission in the R.F.C. last January.

* * *

COLLINS.—Lt. Harold George Collins, R.F.C., eldest son of Mr. D. George Collins, C.C., of Shirley Park, Croydon, was killed in an air fight on April 9th, aged 22. He was observer in the Flying Corps and had seen much air fighting. At the outbreak of war he enlisted in the Royal West Kent Regt., and received his commission in the A.S.C., volunteering for the R.F.C. early in 1916. He was educated at Wellingborough College. His commanding officer writes:—"He behaved in a wonderful way. Early in the engagement (which was one of the hottest aerial fights which has taken place) he was badly wounded in the right hand, but in spite of this he continued fighting his machine-gun in a heroic manner till he was mortally wounded, and was dead when the machine landed." His pilot writes:—"Believe me, your son was magnificent to the very end, he never lost his head, though the hail of bullets was terrific."

* * *

COWAN.—Capt. and Flt. Commander Sidney Edward Cowan, M.C., R.F.C., reported missing in November, 1916, and now unofficially reported killed in action, was the youngest son of Mr. P. C. Cowan, D.Sc., of 33, Ailesbury Road, Dublin, Chief Engineering Inspector of the Local Government Board for Ireland. He was born in 1897, and educated at Castle Park, Dalkey, Marlborough College, and Trinity College, Dublin.

A letter from an officer at the front, also a Marlburian, states that he came across the grave of his schoolfellow in an old graveyard at Ablainzeville, 12 miles south-east of Arras. It is railed in, and a cross at the head bears an inscription in German:—"In memory of a gallant English officer, Captain S. E. Cowan, killed in an air combat. 17th November, 1916."

For a youth of 19, Captain Cowan had a wonderful record in the Flying Corps, having been three times decorated within a year. He gained the Military Cross in May, 1916, a bar on Oct. 20th, 1916, and a second bar on Nov. 14th, 1916.

He won the Cross by an exploit which was described in the "Gazette" as follows:—"Dived onto an enemy machine in the enemy's lines, and drove it to the ground, where it was smashed, and then circled round and fired at the pilot and observer as they ran for shelter. Although forced to land through his engine stopping, he contrived to restart it, and got back under heavy fire." When he won the first bar it was officially stated:—"He has done fine work in aerial combats, and has shot down four enemy machines." Describing the feat for which the second bar was awarded, the "Gazette" stated that:—"He fought a long contest with seven machines, finally bringing one down in flames. He has displayed great skill and gallantry throughout."

* * *

GIBSON TURNBULL.—Lt. David Stevens Gibson Turnbull, Black Watch and R.F.C., who was killed on the 15th inst., at Knaresborough, Yorkshire, was the son of A. Gibson Turnbull, 16, Glencairn Crescent, Edinburgh, and beloved husband of Edith N. Shiells.

* * *

LILLIS.—Lt. Martin Arthur Lillis, Royal Irish Regt., attached R.F.C., who was killed in action on April 11th, was the youngest son of Mr. and Mrs. Thomas Barry Lillis, Carrig, Queenstown, Co. Cork.

* * *

LOCKHART.—Capt. George Barclay Lockhart, 24 years of

age, only son of Barclay Lockhart, J.P., Milton, Kirkcaldy, was killed in France on April 14th.

He was educated at Kirkcaldy High School and Merchiston Castle, Edinburgh, and at the Glasgow Technical College, and was afterwards associated with his father and uncle (Provost Sir Robert Lockhart) in the business of N. Lockhart and Sons, linen manufacturers, Kirkcaldy.

Fond of outdoor sports, he was above the average in football, tennis, and gymnastics, etc., and he was a keen motor cyclist.

At Merchiston Castle he was a member of the O.T.C., and on leaving school he joined the Highland Cyclist Battalion, in which he rose to the rank of Captain. At the outbreak of war he volunteered for foreign service, but was kept for some time on coast patrol duty with the H.C.B. In June, 1916, he was attached to the Royal Flying Corps, and after a period of training as a pilot, he went to the front in November, and had since taken an active part in the work of the R.F.C. in France.

He and his observer were attacked by two Hun machines and were brought down, falling close to the German lines. After dark our men crawled out and found the pilot and observer dead, and brought back the bodies.

Captain Lockhart was a man of a singularly genial disposition, and his early demise will be mourned by a large circle of friends. It is less than a year since his cousin, Lieut. Jack Lockhart, son of Provost Sir Robert Lockhart, gave his life in his country's service, the two young men having been engaged in business together.

* * *

MARSHALL.—Sec. Lt. John Arthur Marshall, Cyclists' Battn. and R.F.C. (reported missing, believed to have been killed in aerial action on Good Friday), was elder son of Capt. James Marshall, Rifle Brigade, of Hartford Cottage, Huntingdon. He was 19 years of age and was gazetted to the Cyclists' Battn. in Dec., 1914. He was appointed to the R.F.C. in Nov., 1916.

* * *

McLOUGHLIN.—While making a flight on the South Coast Sec. Lt. E. T. McLoughlin, R.F.C., met with a fatal accident.

It is supposed that a mishap occurred to the machine, a monoplane, on which Mr. McLoughlin was making a flight, as it ignited and nose-dived to earth. The officer was alive when removed from the wreckage, but died from his injuries an hour later.

* * *

MORRISON.—Norman Walter Morrison, Sec. Lt., R.F.C., killed in action on April 14th, was the elder son of Walter and Gertrude Morrison, of Theydon, Reigate. He was aged 19 years.

* * *

SPENCER.—Lt. J. M. J. Spencer, Northumberland Fusiliers, attached R.F.C. (killed in action on Nov. 3rd, 1916), was second son of Mr. R. E. E. Spencer and of Mrs. Spencer, of Walbottle Hall, Newburn-on-Tyne. He had his commission in Oct., 1914, and was promoted in June, 1915. His appointment as flying officer was gazetted in Sept., 1916.

* * *

TODD.—Capt. Valentine O. Todd, the King's Own (Royal Lancashire Regt.), killed in action on April 10th, was second son of Col. O. Todd, A.M.S., and Mrs. Todd. He was 33 years of age, and entered the Service in 1905; he was promoted Captain in Feb., 1915, and was attached to the R.F.C.

* * *

TRUSCOTT.—Lt. Francis George Truscott, M.C., Suffolk Regt., attached R.F.C., reported missing, and believed killed in the great aerial battle on April 6th, was the elder son of Sir George Wyatt Truscott, Lord Mayor of London (1908-9), and of Lady Truscott, and grandson of Sir Francis Wyatt Truscott, Lord Mayor (1879-80). He was born in Aug., 1894, and educated at Rugby and Trinity College, Cambridge. He represented his College at Henley in 1913. At the outbreak of the war, and while in residence at the University, he obtained a commission in the Suffolk Cyclist Corps and went to the front. He won the Military Cross and was mentioned in dispatches for bravery at Loos. Later on he joined the Royal Flying Corps, and a few weeks ago was instrumental in destroying two German aeroplanes. A brother officer writes of him:—"The squadron has lost a splendid observer and a constantly cheery officer—we nicknamed him 'Trusty'—and the Service a very keen and gallant fellow."

ENGAGEMENTS.

GRIFFITH—WESLEY-SMITH.—A marriage has been arranged, and will take place on May 1st, at St. Peter's Church, Harrogate, between Edward Noel Griffith, Lt., Oxford and Bucks Light Infantry, attached R.F.C., son of Col. and Mrs. J. C. Griffith, Deanwood House, Cheltenham, and Margery Joan, second daughter of Dr. and Mrs. Wesley-Smith, of Beech Grove, Harrogate, and Seaholme, The Riviera, Folkestone.

* * *

McCLAUGHRY—CROOKES.—An engagement is announced between Capt. Wilfred A. McLaughry, R.F.C., elder son of R. McLaughry, of Adelaide, Australia, and Joan, youngest

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MARRIAGES.

BULLOCK—LUPTON.—On April 18th, at Essex Church, Kensington, by the Rev. Dr. Hargrove, Christopher Llewellyn Bullock, I.C.S., Captain, the Rifle Brigade, and R.F.C., was married to Barbara May, second daughter of Mr. Henry Lupton, of Torquay.

* * *

DARWIN—ROSE.—On April 18th, at Holy Trinity Church, Brompton, the marriage took place of Capt. C. J. W. Darwin, Coldstream Guards and R.F.C., eldest son of Col. and Mrs. Charles Darwin, Elston Hall, Newark, and Dryburn, Durham, and Miss Sibyl Rose, youngest daughter of Mr. and Mrs. Charles M. Rose, of 22, Hans Place. The officiating clergy at the service, which was choral, were the Ven. the Archdeacon of Durham and the Rev. A. Hamilton King, M.A. The church was decorated with palms and white flowers. The bride was given away by her father. The bridesmaids were the bride's sister, Miss Madge Rose, Miss Egerton Leigh, and Miss Diana Cumberlege, niece of the bride. The pages were Master David

Wilson and Master Adam Bell. Viscount Marham was best man. Later, Capt. and Mrs. John Darwin left for Hindhead.

* * *

NOYES--MINNS.—On April 10th, 1917, at St. Michael and All Angels, Stoke Newington, Thomas Arthur Noyes, R.F.C., youngest son of the late Edward Noyes, of Moorgate Street, E.C., and of Mrs. Noyes, of Muswell Hill, was married to Dorothy Minns, second daughter of Mr. and Mrs. Sidney Minns, of Stoke Newington. Australian papers, please copy.

* * *

WITHERS—LAWFORD.—On April 19th, at St. Ippolyt's Parish Church, Herts, by the Rev. H. R. Foster, Stuart Dudley Withers, Border Regt. and R.F.C., of Clifton, Bristol, was married to Constance Gertrude, daughter of Mr. and Lady Gertrude Lawford, of Seaford, Sussex, by special licence, owing to orders for overseas.

BIRTHS.

COOPS.—On the 16th inst., at 18, Horsemarket Street, Warrington, the wife of Sec. Lt. F. C. Coops, R.F.C., of a daughter.

* * *

TERRY.—On April 11th, at 52, Bedford Avenue, Barnet,

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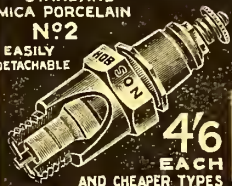
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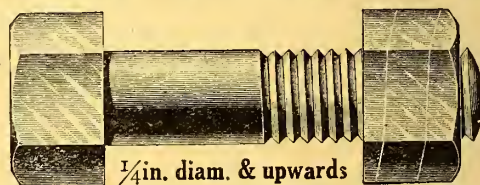


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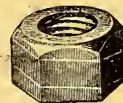
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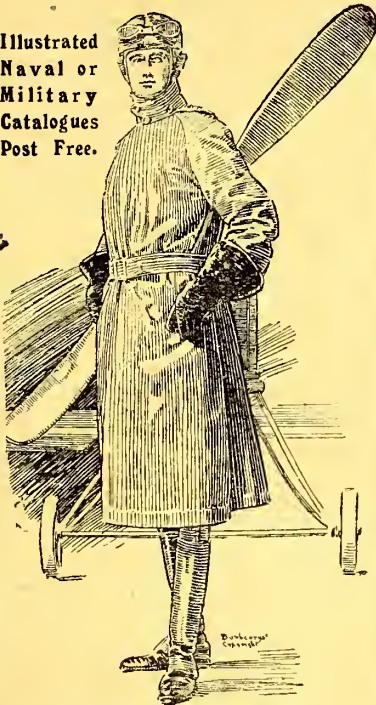
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* * *

News has been received that Lt. James Fairbairn, R.F.C., son of Mr. and Mrs. Charles Fairbairn, of Banongil, Skipton, Australia, is a prisoner of war in Germany, and is in hospital at Münden with a broken arm, and being well treated.

FRANCE.

OFFICIAL COMMUNIQUÉS.

APRIL 17th.—In the period from April 16th to April 15th our pilots accomplished many feats. Capt. Lecourt Grandmaison, Sec. Lt. Languedoc, and Quartermaster Rousseau each brought down his fifth German machine. Lt. Pinsard also brought down three enemy machines, which brings up to eight the number which he has destroyed. Adjutant Vitalis brought down his seventh enemy machine, and Lt. Doullin his 13th. Finally, Capt. Guynemer gained his 36th victory.

APRIL 20th.—Since April 16th, 10 German aeroplanes and two captive balloons have been brought down by our pilots in aerial encounters.

On April 21st, in the daytime, three German aeroplanes were brought down by our pilots.

APRIL 22nd.—Yesterday evening German aeroplanes dropped several bombs in the region of Dunkirk. Three persons were slightly injured. The material damage done was small.

APRIL 22nd.—ARMY OF THE ORIENT.—An enemy aeroplane was forced to land in the Koritz region. The two officers on board were taken prisoners.

APRIL 23rd.—On April 22nd, in the daytime, our pilots engaged in numerous aerial fights, in the course of which six enemy aeroplanes were brought down.

One of our groups, composed of 14 aeroplanes, during the night of the 22nd-23rd dropped 1,740 kilogrammes (about 1½ tons) of projectiles on the stations and bivouacs of the valley of the Aisne.

GERMANY.

OFFICIAL COMMUNIQUÉS.

APRIL 16th.—On April 14th at noon an enemy air squadron of 12 machines attacked the open town of Freiburg, in Breisgau. At five o'clock in the afternoon a second attack was made by two other squadrons, totalling 23 aeroplanes. To these nefarious raids a number of persons, unfortunately, fell victims. Seven women, three men, and one soldier were killed; 17 women, eight men, and two children were injured.

The enemy aviators selected especially as objectives, besides the new municipal theatre, institutes and infirmaries. The University and Anatomical Institute was considerably damaged. Owing to our effective counter-measures the attack could not be fully executed.

In the course of the air fights which arose with our aviators, who ascended to repel the attack, two enemy aeroplanes were shot down near Schlettstadt and Markkirch, and a third was brought down in an air engagement, combined with gun-fire from the ground. All three aeroplanes are of British types, with British occupants. The leader of the raids, a British Lieutenant-Colonel, fell into our hands. According to his statements and the contents of a fly-sheet, of which copies were dropped, the attacks were a reprisal for the torpedoing of the "Gloucester Castle."

We most resolutely contest the right thus to justify them. Our Government gave England to understand in time enough that it could no longer tolerate the passage of so-called hospital ships within a precisely defined zone. If the British notwithstanding, despising our warning, misuse the Red Cross for transport purposes in the blockaded zone, they must bear the consequences of their action, but to act against an open town out of revenge is cheap glory. There are no militarily important objects in Freiburg to justify the attack.

APRIL 18th.—ARMY GROUP OF THE CROWN PRINCE.—During the fighting on Monday, during aerial combats and by means of anti-aircraft guns, 18 enemy aeroplanes were shot down. At several places the aviators joined in the infantry engagements by dropping bombs and by machine-gun fire.

APRIL 21st.—The unfavourable weather prevailing during the last few days has restricted aerial activity. Since April 17th seven enemy aeroplanes have been brought down in aerial engagements, and three by anti-aircraft guns.

APRIL 22nd.—The enemy lost six aeroplanes in aerial battles yesterday. Of these five were shot down by Baron von Richthofen's chasing squadron.

Naval aviators off Nieuport brought down an enemy airship, which fell into the sea in flames.

APRIL 23rd.—Our aviators shot down four enemy captive balloons, which collapsed on fire, and in air battles brought down 11 aeroplanes.

Capt. von Richthofen for the 46th time and Lieut. Wolff for the 20th time remained victors.

The chasing section of Capt. von Richthofen up to yesterday has shot down 100 enemy aeroplanes.

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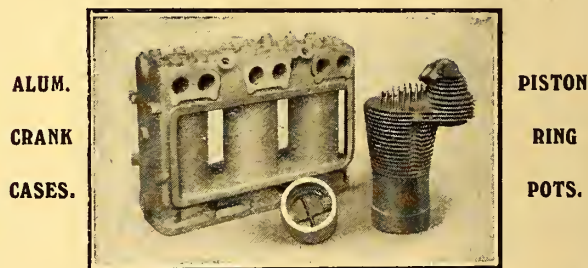
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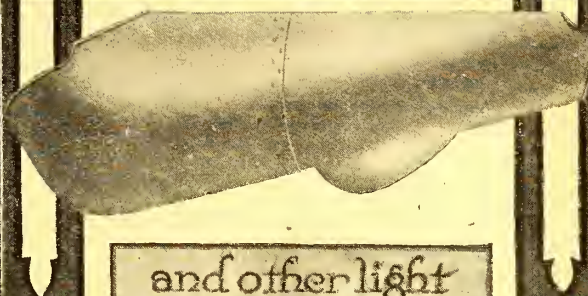
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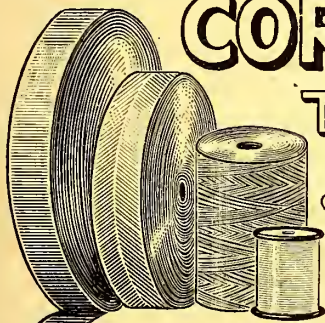
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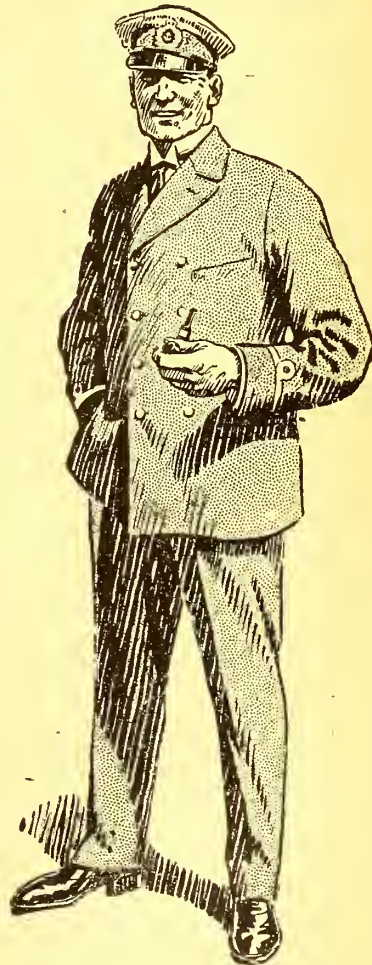
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ITALY.

OFFICIAL COMMUNIQUÉS.

APRIL 17th.—A squadron of enemy aeroplanes, supported by submarines and torpedo-boats, approached Venice during cloudy weather with a view to effecting a reconnaissance in force. An immediate counter-attack by combined Italian and French machines, aided by anti-aircraft batteries, prevented the hostile aeroplanes from reaching the city. During the aerial fighting which ensued and was continued far out to sea an enemy aeroplane was brought down. Two of our seaplanes failed to return to their base.

APRIL 18th.—One of our aerial squadrons bombarded Chiapovano (12 miles north-east of Gorizia), an important enemy re-victualling centre to the east of the Spirito-Bainsizza (Heiliger-Geist-Banjsice on the east bank of the Isonzo Plateau, in spite of violent fire from the enemy's artillery. Our aviators returned to our line unhurt.

APRIL 19th.—One of our aerial squadrons bombarded enemy huts in the neighbourhood of Chiapovano (12 miles north-east of Gorizia), Dornberg, and Reifenberg (on the Gorizia-Trieste railway), and Comen (on the Carso). All our machines returned unharmd.

APRIL 20th.—Last night enemy seaplanes dropped bombs on various places on the lower Isonzo. No casualties or damage are reported. At the same time one of our airships bombed with good results the railway station and lines of Opicina (north-east of Trieste), returning safely afterwards.

The Italian Minister of Posts and Telegraphs has decided to establish a daily aerial mail service between the mainland and Sardinia, in order to avoid the danger from submarines.

APRIL 21st.—Our aeroplanes raided the town of Chiapovano.

APRIL 22nd.—Yesterday one of our air squadrons bombed the (Gorizia-Trieste) railway centre between Prvacina and Dornberg (Vippacco Valley). All our machines returned safely within our lines. During the night one of our airships again dropped bombs on the same place, returning safely to its base.

CONGRATULATIONS.

FFISKE—DANDRIDGE.—On April 19th, at St. Paul's Church, Knightsbridge, London, by the Rev. C. M. Chamberlin, M.A., of Brundall, Norfolk, assisted by Rev. F. W. Green, M.A., St. Paul's Church, Knightsbridge, Geoffrey Ernest, youngest son of Henry fiske, Holm Close, Brundall, was married to Ethel Mary, only daughter of Alfred Dandridge, Brooksleigh, Beckenham, Kent.

THE KING'S VISIT TO THE SOPWITH WORKS.

When the King and Queen visited the Sopwith works on April 19th, they were received by Mr. T. O. M. Sopwith, chairman of the company, by Mr. Cary, the general manager, and by Mr. Sigrist, the works' manager, and spent an hour and a half in the various shops. The Queen was keenly interested in the skilled work which was being performed by women.

Afterwards the King and Queen drove to the Brooklands Aerodrome, where they witnessed practical demonstrations with machines built at the factory, and flown with his usual skill by the Australian pilot, Mr. Harry Hawker, who had the honour of being presented to their Majesties.

[It is eminently satisfactory that the King should have thus an opportunity of seeing the performances of some of the best British aeroplanes, as hitherto his attention has been directed with so much care to the alleged super-excellence of officially designed machines.—Ed.]

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[Harold Roshier's letters are among the most illuminating documents which the war has produced, and should be read by all who have not already read the more expensive edition.—Ed.]

ALTERATIONS TO STOCK.

The Aircraft Supplies Co., Ltd., of 17, John Street, Theobald's Road, W.C.1., report that the majority of the Admiralty Type Strainers, listed in their advertisement in the current issue of THE AEROPLANE as being in stock, have been sold, and an announcement regarding others expected will be made later.

This announcement is made owing to it being too late to alter their advertisement, the portion of the paper in which this appears having gone to press in advance.

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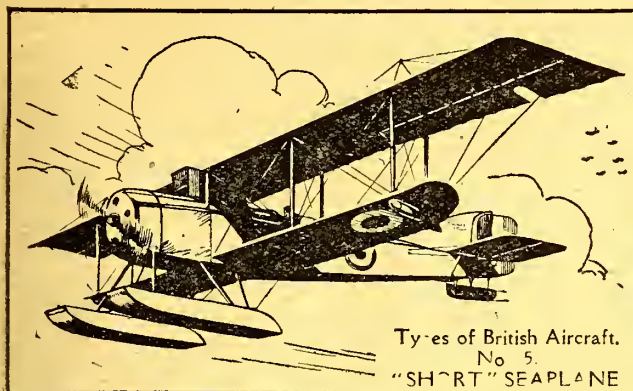
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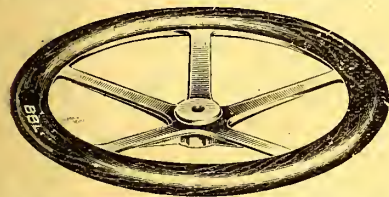
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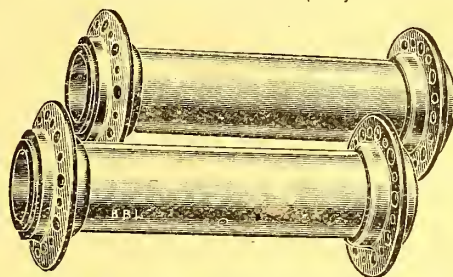
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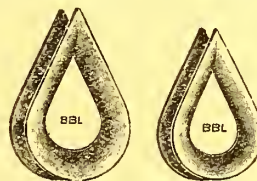
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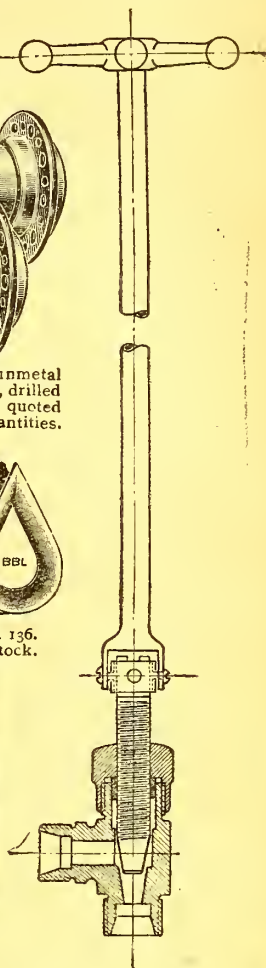
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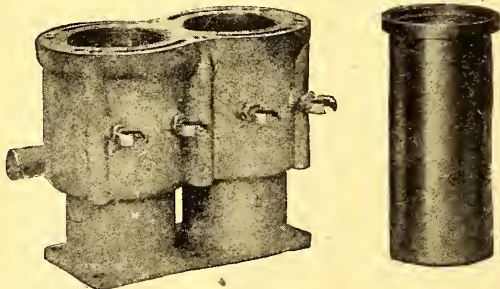
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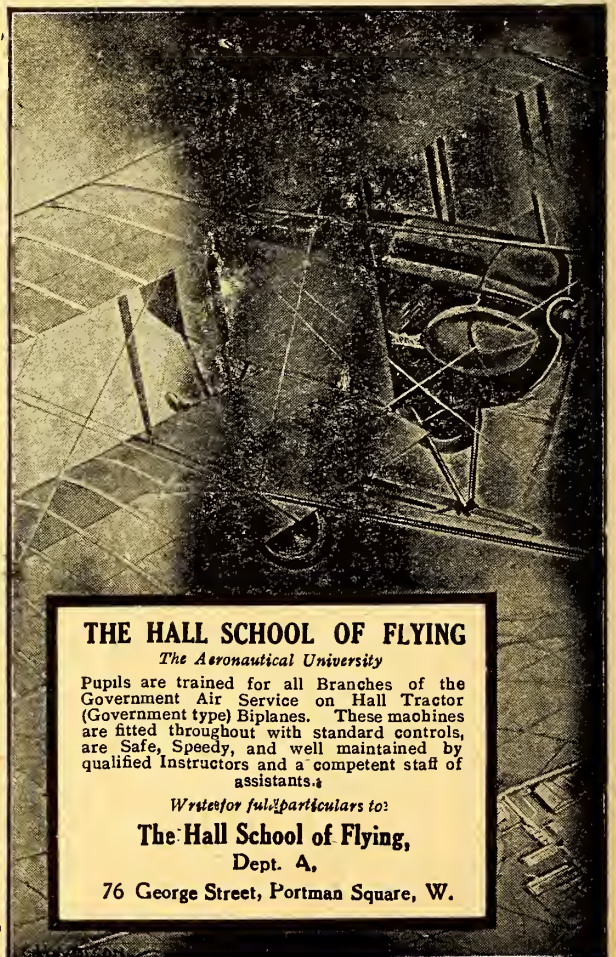
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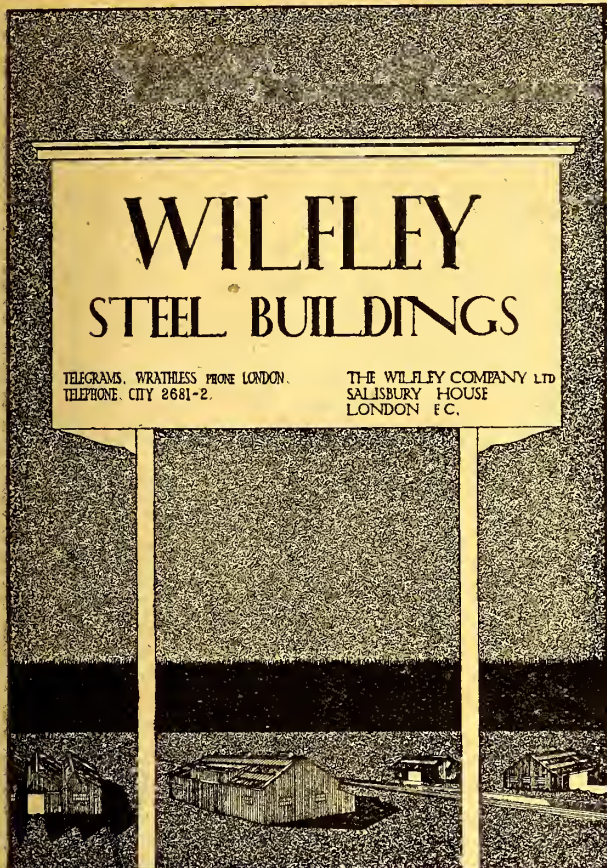
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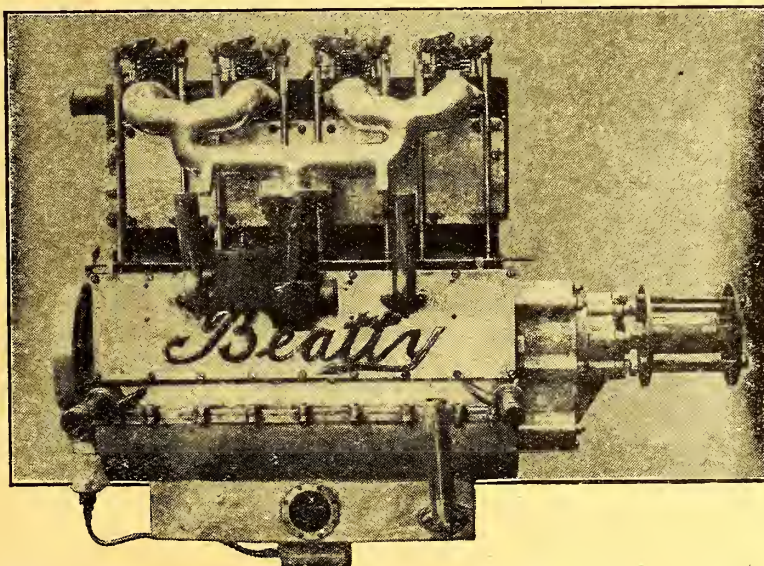
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ON OUR STATECRAFT AND LEARNING.

They bought us anew with their blood, forbearing to blame us.

Those hours which we had not made good when the Judgment o'ercame us.

They believed us and perished for it. Our statecraft, our learning,

Delivered them bound to the Pit and alive to the burning

Whither they mirthfully hastened as jostling for honour.

Not since her birth has our Earth seen such worth loosed upon her.

Nor was their agony brief, or once only imposed on them.

The wounded, the war-spent, the sick received no exemption:

Being cured they returned and endured and achieved our redemption,

Hopeless themselves of relief, till Death, marvelling, closed on them.

That flesh we had nursed from the first in all cleanness was given

To corruption unveiled and assailed by the malice of Heaven—

By the heart-shaking jests of Decay where it lolled on the wires—

To be blanched or gay-painted by fumes—to be cindered by fires—

To be senselessly tossed and re-tossed in stale mutilation

From crater to crater. For this we shall take expiation.

But who shall return us our children?

Thus Mr. Rudyard Kipling, his only son having been killed in action, addresses himself to those who by their refusal to prepare for war have cost this nation the lives of so many thousands of its best and bravest.

The lines were not written with special reference to the Flying Services, though they well might have been. The statecraft which endeavoured to make a Government monopoly of aeroplanes and engines before and early in the war almost succeeded in extinguishing the Aircraft Industry just before the war broke out, and has depleted our supply of aeroplanes ever since. The learning which has resulted in our men, as officially confessed last week, being sent out on bombing and reconnaissance expeditions on 90-h.p. B.E.s. to do the work for which the Germans use more efficient machines with engines of 160 h.p. and 200 h.p. has delivered them bound to the Pit of a German prison camp, or to the burning of an inferior aeroplane shot down in flames by a more powerful enemy, or to a crash between the lines where the injured crew have been shelled by German guns, to be senselessly tossed and retossed from crater to crater.

And unless those newly arrived in High Places guard themselves well, they will find that those same people whose learning has given the best men in the world very nearly the worst aeroplanes will ere long arrive at giving them almost no aeroplanes at all.

We have, and we have always had, the best aeroplanes in the world in this country, but our learned scientists seemingly succeeded in persuading those responsible for supplies in the past that theoretical efficiency is more desirable than actual if less economical performance. And to-day those who profess to be learned in the theories of organisation are like to produce a disorganisation of supplies alongside which

primeval chaos was an ensample of law, order, and decency.

The only result that one can foresee from the latest attempt of the learned is that the break-up of the successful system of practical commercial production, and its succession by a species of amateurish Socialism, will result in still further diminution of the much-needed supplies of the "newest and most up-to-date machines" which Sir Douglas Haig demanded in his dispatch four weary months ago. Let the Air Board be very alive to this threatened danger.

THE ELECT OF THE NATION.

And what do the representatives of the nation care about the children who shall not return? Over six hundred men have been elected to the House of Commons to govern the people, and to safeguard them in time of trouble. At no time on Thursday last did so many as fifty of those six hundred gather together to take counsel concerning the welfare of the Flying Services.

They are the same six hundred who had not made good when the Judgment o'ercame us. They are still little concerned with making good, or they would have been in their seats to listen to criticism of official mistakes, and would have sought further knowledge from officialdom on so vital a matter as those Services which, besides being the eyes of the Navy and Army, should be our great weapons of offence against enemy submarines at sea and enemy munition production on land.

It is possible that the absence from the House of Commons of ninety-two per centum of its members during what should have been one of the most important debates of the session was a clever political manoeuvre designed to discredit the critics. Mr. Bonar Law, the present Leader of the House, has ever seemed

desirous of protecting the administration of the Flying Services from criticism, and to so old a Parliamentary hand, at the head of a Coalition and controlling the Whips of both Parties, such a manoeuvre would seem simple. If such were not the case, then let us have an official denial. If such were the case, then in God's name give us back the Party System, with all its evils, in preference to a single control which can burke criticism by removing from the hearing of the critics all those whose duty it is to hear them, and can artificially produce what seems to the unsuspecting elector an atmosphere of contemptuous indifference.

So far as the absent ninety-two per centum of the House is concerned, one can only assume that all they like sheep have gone astray and have followed the bell-wether into wilful ignorance of the truth. It is little wonder that Mr. Winston Churchill, the one man of Cabinet rank capable of handling the Flying Services with inside knowledge, should have left the House

rather than waste his efforts on an audience of less than forty members, most of whom were already in sympathy with anything he could possibly say.

The obedient daily newspapers, as usual, cut short their reports of the debate, and it therefore remains to THE AEROPLANE to give the people immediately concerned for those who fly some adequate idea of what was said. The immense length of the speeches, which occupy over forty pages of Hansard, make it impossible even for this paper to report them in full, but every effort has been made to avoid omitting any phrase of importance. In accordance with previous custom, comments on the speakers' remarks are interpolated, and may be distinguished by their being enclosed in brackets.

Before the debate itself the questions and answers for the previous two days have been inserted, as they bear directly on the speeches, and are of the nature of preliminary skirmishes before a general action. Let us therefore proceed to the matter in hand.—C. G. G.

QUESTIONS IN THE HOUSE.

ORAL ANSWERS. April 24th.

FREIBURG (AIR RAID).

Mr. Molteno asked the Prime Minister whether the bombing of Freiburg, announced by the Admiralty as having taken place on April 14th as a reprisal for the sinking of British hospital ships, is in accord with assurances given to this House from time to time; and whether it is part of a new policy of entering into a competition with the enemy by way of reprisals?

Mr. Bonar Law: I have nothing to add to the reply which I gave on Thursday last to the hon. Member for Mid-Armagh.

Mr. Molteno: Seeing that the casualties incurred included 26 women and children killed and injured, does the War Cabinet think that it would be in accordance with the high principles of humanity if fighting men are withdrawn from fighting the armed forces of the enemy to attack the civil population, when casualties of this kind are likely to occur, in view of the fact that women and children are now in the majority?

Mr. Bonar Law: My hon. friend must be aware that these considerations were fully weighed by the Government before they took the course which was taken.

Mr. Pringle: Has the Government made up its mind as to what it will consider a test of the success of this policy of reprisal?

Mr. France: Is not the best reprisal of all to fight and beat the Germans in accordance with British traditions both on land and sea?

Mr. Bonar Law: Yes; but we think also that in certain circumstances reprisals are inevitable.

[As Mr. Pemberton-Billing, Mr. Joynson-Hicks, and others stated a year or two ago.—Ed.]

WRITTEN ANSWERS. April 24th.

EXCESS PROFITS DUTY (AIRCRAFT MANUFACTURERS).

Captain Burgoyne asked the Chancellor of the Exchequer whether he has received a deputation on behalf of the small number of pioneer aircraft manufacturing firms in reference to the hardship they incur owing to the Munitions Act and the Finance Act, in view of the pioneer work done by these firms before the war, the importance now given to aviation, the signal services they have rendered to the nation, the inadequate standard years they can show from their pre-war accounts, the unfavourable comparison with firms building aircraft only since the war but who can show good pre-war standards on other products, and the necessity that the designing firms shall be firmly established during the war if they are to be of service after the war; and whether he can see his way to establish both for the Munition Act and the Finance Act the first complete war year's accounts of each firm as their standard year?

Mr. Bonar Law: The answer to the first part of the question is in the affirmative. As regards the second part it would not be possible to adopt the suggestion made by my hon. and gallant friend without a complete departure from the principles of the Excess Profits Duty. Under the existing law it is open to any class of business to make an application to the Board of Referees for an increase of the statutory percentage on capital.

ORAL ANSWERS. April 25th.

AIR SERVICES:—MACHINE FOR ARTILLERY RECONNAISSANCES.

Mr. Billing asked the Under Secretary of State for War whether any machines of the BE2C, BE2D, or BE2E types have been employed over enemy territory during the recent offensive operations on the Western Front; and, if so, whether it is proposed to continue so to employ them?

The Parliamentary Secretary to the Air Board (Major Baird):

The types of machine referred to in the question are mainly employed for artillery reconnaissance, for the carrying out of which it is necessary that they should fly over enemy territory. The answer to the second part of the question is in the affirmative. I would add—and on this point I take the opportunity of correcting an answer which I gave to the hon. Member on March 20th—that these machines are also used for bombing expeditions when large operations are in progress.

Mr. Billing: Will the hon. and gallant gentleman have inquiries made whether these machines are fit to send on bombing expeditions in view of the enormous losses they have suffered?

Major Baird: In the view of the officers responsible they are fit for this sort of work.

Mr. Billing: Is the hon. and gallant gentleman aware that it takes them 50 minutes to climb 5,000 feet, and their speed is 70 miles an hour?

Major Baird: It is impossible to discuss this by question and answer. The hon. Member will have an opportunity.

CAPTAIN LEEFE ROBINSON, V.C.

Mr. Billing asked the Under Secretary of State for War on what type of machine was Captain Leefe Robinson, V.C., flying when he was shot down?

Major Baird: The type of machine on which this very gallant officer was flying when he was shot down was a Bristol Fighter.

Mr. Billing: Is the hon. and gallant gentleman aware that this officer had no fighting experience in this type of machine?

Major Baird: I do not think that is so. I will inquire.

Sir C. Hobhouse: Is it not a fact that this officer is now discovered to be alive and a prisoner in German hands?

Major Baird: We are not quite sure whether he is alive, but there is still reason to hope he may be, but it is by no means certain.

[Major Baird might have been asked whether Captain Robinson had had any experience of fighting aeroplanes, or whether his experience was wholly, or almost entirely, against airships.—Ed.]

GERMAN OUTRAGES (REPRISALS).

Colonel C. Lowther asked whether His Majesty's Government will take immediate steps to inform the German Government that unless their general military staff spare Laon Cathedral and other buildings of purely æsthetic, but of no military value, reprisals will be taken, when the opportunity permits, upon Cologne Cathedral and other monuments cherished by the German people for their beauty and historic interest?

Mr. Bonar Law: The Government do not see their way to adopt the suggestion of my hon. friend.

Colonel Lowther: May I ask whether these acts of vandalism will be allowed to continue without any protest or any reprisal?

Mr. Bonar Law: They will not be allowed to continue if we can stop them. This whole question of reprisals is a very difficult one. I do not think the hon. Member's suggestion is practical.

[Having admitted the use of reprisals the day before, why not go the whole hog and do the thing properly?—Ed.]

WRITTEN ANSWERS. April 25th.

AEROPLANES (ALLOCATION).

Mr. Billing asked the Parliamentary representative to the Air Board whether the Royal Flying Corps have a prior claim to the Royal Naval Air Service to all the latest types of aeroplane at present under construction in this country; and whether it is proposed that all such machines of high efficiency now on order for the Royal Naval Air Service shall be transferred to the Royal Flying Corps?

Major Baird: The answer to both parts of the question is in the negative. Every endeavour is made to meet the requirements of

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ORAL ANSWERS. April 26th.

PRINCE FREDERICK CARL'S BODY.

Captain D. Hall asked the Prime Minister whether any application has been received from the Kaiser or the German Government through any neutral Power that the body of Prince Frederick Carl of Prussia, who died from his wounds while a prisoner in the hands of the British, should be handed over for interment in Germany; and whether, if such application has been made, or is made, the British Government will insist, as a condition for granting the same, that the body of Nurse Cavell and Captain Fryatt be handed over for fitting burial in this country?

Mr. Bonar Law: No official application has been received, but a verbal and private inquiry was recently made by the sovereign of a neutral country through the diplomatic representatives in this country, as to whether the body of the late Prince Friedrich Carl of Prussia could be sent to Germany. The reply given was to the effect that it was impossible at present, but that, so far as we are concerned, there would be no objection to this being done on the conclusion of hostilities.

GERMAN OUTRAGES (REPRISALS).

Major Chapple asked the Prime Minister whether it can now be stated that British aircraft dropped bombs on open German towns, killing women and children; whether, if this is to be continued as a policy designed to deter the German high command from ordering the sinking of hospital ships, he will, before any other raid is ordered, consider that the peculiar quality of German morality gives our enemies resources in brutality beyond our reach and makes the military cast oblivious to any kind of reprisal which leaves them personally unhurt, so that the end desired is, therefore, not likely to be attained; that it would be more consistent with British tradition and more likely to appeal to German military rulers if the Government were to adopt the alternative policy of a joint announcement by the Allies (including, if possible, America) to the effect that, without prejudice to the present position, a special inquiry, with a view to fixing responsibility, will be held into all attacks on hospital ships, and that those in whatever rank or station found to be in any degree responsible, either because they ordered or carried out such attacks, or because, having had the power to prevent them, they failed to do so, will be dealt with personally at the Allies' discretion?

Mr. Bonar Law: It is not possible for me to add anything to the statements that I have made on this subject, but I may add that I do not think that the suggestion of the hon. Member is practicable.

THE DEBATE ON THE AIR BOARD.

On April 26th, on a Vote of Supply, the **Parliamentary Secretary to the Air Board (Major Baird)** said: There has been no opportunity hitherto of explaining precisely what the Air Board is, and what are its duties. The present Air Board was created by a Minute of the Cabinet on Dec. 22nd last. It retained all the powers of the previous Air Board, with a certain number added. I would ask hon. Members to remember, if, perhaps, they are a little disappointed with the powers now exercised by the Air Board, that in proceeding, not only with a new arm, but with an arm which is of vital importance to both Services, and which is fighting daily, it is absolutely necessary to avoid any rash experiments which might lead to a diminution, either of the output of machines or a dislocation of the activities of the Services at the front. Therefore, it is essential to proceed cautiously.

[Which, doubtless, is why rash experiments are being tried in matters of supply to-day.]

The present composition of the Air Board is as follows: There is a President, Lord Cowdray, a Director-General of Military Aeronautics; there is the Fifth Sea Lord, who is a Director of the Air Service at the Admiralty; a Controller of Aeronautical Supplies, who is an officer of Munitions; there is the Controller of Petrol Engines, equally an officer of the Ministry of Munitions; and there is the Parliamentary Secretary, who, in the absence of the President, has to preside at the meetings of the Board.

The duties of the Board may be summarised as follows: The Admiralty and the War Office concert their respective aerial policies in consultation with the Air Board. The Admiralty and the War Office formulate the aerial programmes required for the fulfilment of the approved policy. Then the Air Board decides the extent to which it is possible to meet that approved departmental programme. The Air Board selects and is responsible for the design of the aeroplanes and seaplanes and for their engines and accessories; the Board furnishes approved plans and specifications to the Controller of Aeronautical Supplies, and to the Ministry of Munitions, which is responsible for their production, and who subsequently hand them over for the use of the Air Service for which they are designed and manufactured.

It is quite obvious that that arrangement is open to the criticism that too many cooks may spoil the broth. It is equally

open to the contention that it fetters them. But if you have a stiff hill to climb four horses are better than two.

[Which is a false analogy.]

For the success of our work two conditions are essential. First, that all the members of the Board should work in the closest harmony and co-operation—and that we have got to the utmost extent—and the second is what was not foreseen at the composition of the Air Board, but what has been achieved since, that everybody should be housed under the same roof. The idea of the Naval Air Service having to visit first of all the Air Board in one house and then to go on to the Ministry of Munitions in another house, and of their correspondence having to be passed backwards and forwards by boxes, or through telephone, and so on, would have led to delay which in a service where it is absolutely indispensable that the user of the machine should be in constant daily communication of the closest nature with the producer of the machine would inevitably have led to disaster.

[Which is just what has not happened in the past. The user of the machine (the active service pilot) has been fenced off from the producer (the manufacturer) by all the official experts.]

Criticism may be offered that this arrangement applies only to heavier-than-air machines. . . . The Army does not use lighter-than-air machines, and consequently there is no question of any competition between the Army and Navy in regard to manufacture. As seaplanes and aeroplanes are machines of the same nature they require the same materials for their construction. They are made in the same factory. They require the same transport. They require the same sort of labour. They employ the same kind of engines, and it is in these directions that a unification has been effected with a view not only to prevent any kind of overlapping, but with a view to using to the utmost possible extent the resources of the country for the benefit of the nation as a whole.

As I said, the Controller of Aeronautical Supplies, who is a member of the Air Board, undertakes the responsibility, on plans and specifications supplied by the Air Board, of producing the aircraft that are necessary for carrying out the programme of the two Services. But design is a function of the Air Board itself, and it is the business of the Technical Department of the Air Board to settle upon the designs of the aircraft which are used by the two Services. That does not mean that the Technical Department designs aircraft. On the contrary, the Technical Department furnishes the designers of the country in connection with private firms with the requirements of the two Services as sent home from the front. The designers of the manufacturers of the country are supplied with the lists of the specifications, and those designs are received by the Technical Department of the Air Board, specifications are checked and calculated, and they are considered in the light of the best technical experience available. Experimental machines are then ordered for trial.

The head of the Technical Department of the Air Board, Brigadier-General Pitcher, was nominated unanimously by both the Director-General of Aeronautical Supplies and the Fifth Sea Lord, who agree that he is the best man for the post. He is not only a very experienced pilot, but he has commanded a wing at the front, and he is, therefore, in close touch with the requirements of pilots at the front, and he knows what the technical and manufacturing difficulties are from the point of view of the man who has to keep his wing up at the front. The Deputy-Controller of the Technical Department is Captain Groves, of the Royal Navy, who is a Wing Captain in the Royal Naval Air Service, and who, in addition to a long experience—long as far as anything can be said to be in connection with aeronautics—has had considerable experience at the Admiralty and commanded a naval wing abroad. Therefore, we are fortunate in having in these two officers able men in the closest touch with their brother officers in the Services, whose technical attainments are admitted by all who are competent to judge to be perfectly satisfactory and adequate to the discharge of those functions.

[Very excellent appointments, which should have been made a year ago.]

In this technical branch they examine the designs, consider them and report on them to the Air Board, and it is the function of the Air Board to decide whether a design is to be adopted or not.

STANDARDISATION.

One of the chief functions of the Technical Department is to arrive, as far as possible, at a common specification and standardisation of the machines used by the Army and by the Navy. For no very apparent reason, it has occurred in the past that machines of precisely the same type used by the Naval Air Service are different from machines of the same type made for the Royal Flying Corps, and consequently, if the two happen to be serving together, interchangeability is not possible, and there is an inevitable waste of resources.

[One of the criticisms of this paper months and months ago.]

Of course, I do not wish the House to carry away the impression that we are endeavouring to standardise machines on a large scale, because nothing, I believe, could be more fatal

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than that. You might standardise machines, and get vast quantities of them, and when you had them they would be out of date, and you would be better off with one-tenth of the number of up-to-date machines.

[A pity that General Henderson and his technical advisers did not recognise that simple fact when set forth in this paper long before the war, and at intervals ever since.]

It has been carried out in this instance. It used to be the practice for the speed indicators fitted to an aeroplane that was flown by an officer in a blue coat to have the speed marked in knots, but the same machine flown by an officer in a yellow or a brown coat had the speed indicator with the speed marked in miles. That seemed to be an unnecessary duplication, and, therefore, military machines are having their speed indicators marked in miles, and the seaplanes have their speedometers marked in knots. That is only reasonable, as it is the system used on the sea.

[And so Naval aviators who fly both land and sea machines have to be bothered with both systems. However, if they read their knots as miles they are not likely to stall.]

There are a few other points of that sort. Standardisation, so far as it is possible to be carried out, is being carried out to the utmost possible extent.

[As, for example, in standardising innumerable A.G.S. nuts and bolts, instead of the very simple metric system already standardised in France?]

Let me say, further, that there is a very close liaison maintained between the Technical Department of the Headquarters at the front and the Naval Branch of the Air Board. . . . in order to enable modifications desired by the pilots at the front to be produced in the machines, and at the same time keep in London in close touch with the general requirements of the Services at the front.

EXPERIMENTS AND INVENTIONS.

Then, as regards the production of experimental machines, there also the Technical Department has access to the manufacturer through the Director of Aeronautical Supplies. Production in quantity and production of experimental machines are two quite separate departments, and nothing retards production on a large scale more than confusing the two and insisting on a machine being put on a productive scale into a shop before you have got the machine entirely satisfactory for use.

[For instance, standardising immature R.A.F. designs.]

Therefore every effort is made to keep quite distinct the experimental section of the manufacturers from the production section of the manufacturers.

Communications from inventors are, for the moment, dealt with by the Technical Department of the Air Board, but we are in process of creating a Department specially designed for the purpose of dealing with inventions, and for that purpose we are calling upon and hope to secure, the services of the officers and others who have been employed in the Invention Section of the Ministry of Munitions, the Admiralty, and War Office, in so far as they relate to aircraft . . . so that they should form a branch of our Air Board.

THE R.A.F. AND THE TRADE.

As regards the Royal Aircraft Factory, that is considered from the point of view of the Air Board as precisely on the same footing as other manufacturers. It is under the Controller of Aeronautical Supplies. There is at the head of it Mr. Henry Fowler, who rendered great service in connection with the production of munitions. Lastly, the Technical Department is in constant and close communication with manufacturers.

A society of manufacturers has been formed, and both through them and through individual manufacturers the Technical Department keeps in the closest possible touch with the trade. It is hardly possible to go to the Department without finding manufacturers and designers in constant and daily touch with the officers of that Department.

[It is eminently satisfactory to find that at last the manufacturers are being properly recognised, and the S.B.A.C. is to be congratulated on its excellent work.]

I would add that the same close liaison is established between our Technical Department and the corresponding Department of our French Allies, and we are now arranging in the same way with our new Ally, America.

AERONAUTICAL SUPPLIES.

With regard to the Controller of Aeronautical Supplies, I would like to draw the attention of the Committee to the magnitude of the business with which he has to deal. I have been furnished with a list of 958 firms engaged on work for the Directorate of Aeronautical Supplies. Of these, 301 are direct contractors and 657 are sub-contractors. In addition, there are a very considerable number of sub-contracting firms of whom we never hear, unless they have troubles in regard to labour or material. The total number of hands employed by the 50 firms of most importance is 66,700. Dilution has been carried out to the extent of 31 per cent. in those firms, and by dilution I mean the employment of women and males under military age. It is, of

course, necessary to remember that that degree of dilution does not help manufacturers.

There is one point which it may be well for me to refer to now, and that is the recent order issued by the Minister of Munitions concerning the manufacture of experimental aeroplanes. That order is in no way intended to impede progress, but, on the contrary, to directly facilitate it. It is now necessary to obtain a licence in order to be able to manufacture experimental aeroplanes. We want all the inventions we can get, but there are an immense proportion of inventions which, although their creators believe they are bound to revolutionise aeronautics, when they are judged by practical men, it is perfectly obvious that they are of little use. It is to prevent the waste of material, time, and labour on inventions which have no prospect of proving useful to the country that this order has been issued.

[Provided always that the judging is done by competent men who are free from prejudice, and are not interested in other designs, the order is excellent.]

As regards the Royal Aircraft Factory, any designs which it may prepare are subject to exactly the same technical criticism as those of a private firm.

[We have been told the same thing years ago, and one can only hope that this time there are no mental reservations about the statement.]

The factory is under the direct charge of the Ministry of Munitions, and is utilised for detail experimental work, which is carried out under the requisitions of the Technical Department of the Air Board. In addition repair work is carried on, together with miscellaneous urgent requirements. Either in the way of alteration or manufacture it may suddenly become necessary to produce one particular type or any of the hundred and one standards or things required for manufacture, and time is saved by having that work done at the Royal Aircraft Factory, and that is the kind of work that is being done there.

Mr. Joynton-Hicks. By miscellaneous requirements I take it the hon. member does not mean the manufacture of a complete aeroplane?

Major Baird: Certainly I do, because it is often possible to get out the first lot of a new design of an aeroplane quicker from the Factory than it would be if we had to wait for the manufacturer who is going to bring them out.

[A very great change from the past, when the R.A.F. took months to produce what a private firm did in weeks.]

Under the new arrangement the Aeronautical Supply Department, being under the Supply Department of the Ministry of Munitions, benefits directly as regards the many and varied activities of the other Departments of the Ministry; for instance, priority in raw material, machine tools, labour, etc.

When I come to the question of affording additional facilities, a subject in which the hon. member for Brentford (Mr. Joynton-Hicks) is much interested is the adaptation of factories which, owing to changes in the programme of the manufacture of munitions, may become available for employing in the aircraft industry. That policy is carried on so far as possible, but it can only be carried out to a limited extent. Considerable investigations have to be carried out as to the nature of the machines and the character of the work done in the factories when they were used in their former occupation.

[The ability of the officials sent to investigate has on occasion been questioned.]

INSPECTION.

Mr. Tennant: Can the hon. and gallant gentleman elaborate the point about testing by informing the House how and where the tests are made?

Major Baird: The engines are tested at the manufacturers' by Aeronautical Inspection Department under the Aeronautical Supplies Department. The Minister of Munitions is responsible for the quality of the machines produced. Certain modifications have been made in the exact nature of the inspection—that is to say, the principle of inspecting individual parts rather than the inspection of the finished article is being rather extended now. An effort is being made to place men in the factories, whose attainments are sufficiently strong to warrant them being given rather greater latitude in assisting the manufacture than would be possible when you had to depend on unskilled inspectors who discharged their function by a mechanical process. The inspection is now carried out at the works, and the machines are taken over by the Naval Air Service and the Royal Flying Corps at the floor of the works, and they are flown away by representatives of those Services. The Air Board is responsible for the machines, and the Minister of Munitions is responsible for the design and delivery.

Mr. Billing: Am I to understand that these machines are delivered without any air test? Do the Air Services take them over without the air test and only after inspection?

Major Baird: That is so.

We are responsible for the machines until they leave the factory. They are then taken over by the Royal Naval Air Service and the Royal Flying Corps at the factory, and the reason for this is pretty obvious. It is that they are flying men and we are not,

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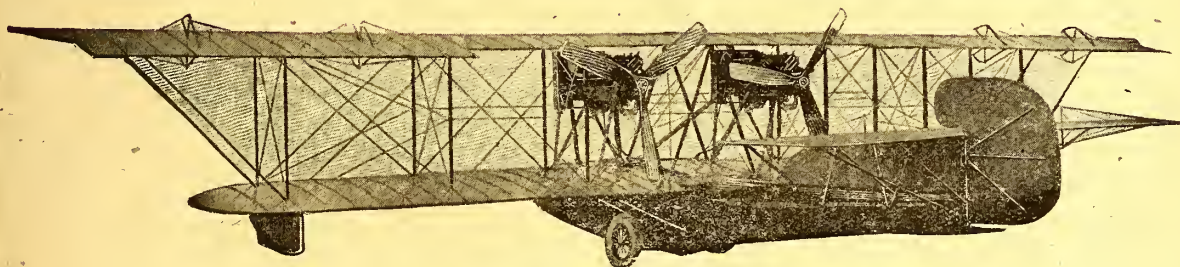
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INCREASED PRODUCTION.

With regard to the ratio of the increase in production. Taking the average monthly output of last year at the arbitrary figure of eight, the output for the first two months of this year, January and February, was 16, the anticipated output for the next three months is 19, and we hope by the end of the year to have doubled that, or very nearly to have doubled it. Let me say also—and this is a point which the Controller of Aeronautical Supplies desires to be realised—that it would be most unjust to forget that those who have had the duty of supplying the aeronautical requirements of the two Services up to the present are solely and entirely responsible for that very satisfactory increase. That is a point which ought to be remembered when people are prone, and I think very unjustly prone, to criticise the arrangements previously made for production.

[To those who know, this only increases the blame on those responsible in the past for the waste of time, labour and material.]

OUR DEBT TO FRANCE.

There is another point which ought also to be remembered. We are under a very large debt of gratitude to our French Allies for the assistance which we have received from them, not only at the beginning of the war, when we had to rely upon them to an enormous and even an appalling extent for our aerial equipment, but for assistance of a very valuable character which we are constantly receiving from them. We hope that it is not altogether one-sided; but they organised their Air Service before we organised ours, and there is no doubt that they are rendering us invaluable service to-day. Our relations, I am pleased to say, are of the most cordial and satisfactory kind.

AFTER-THE-WAR POLICY.

Although its functions are restricted to heavier-than-air machines, and although it has nothing to do with operations, the Air Board does have the duty of considering air policy, and in connection with air policy it appeared to the Board, and it has been approved by the Prime Minister, that it should be our duty to investigate the question of aerial civil transport after the war.

This whole great industry has been built up for the purposes of the war, to make use in warfare of an element which certainly cannot be neglected in peace. Therefore, it does not appear to be unreasonable that the Air Board should take up as a subject of inquiry as far as possible the uses that can be made of aircraft after the war, and for that purpose it has been decided to institute a Committee of which Lord Northcliffe has been asked to take the chair, and has accepted, and it is proposed that the Committee should comprise representatives not only of the two Services and of the Air Board, but also of the Board of Trade, the Post Office, the Foreign Office, the Colonial Office, the Customs, and the Treasury, representatives from the Dominions, representatives, of course, of the manufacturers and designers in this country, and obviously it would be desirable that Parliament should also be represented.

The terms of reference are as follows:—

"To consider and report to the Air Board with regard to:—

"(1) The steps which should be taken with a view to the development and regulation, after the war, of aviation for civil and commercial purposes, from a domestic, an Imperial, and an international standpoint.

"(2) The extent to which it will be possible to utilise for the above purpose the trained personnel and the aircraft the conclusion of peace may leave surplus to the requirements of the Naval and Military Air Services of the United Kingdom and Overseas Dominions."

The proceedings of the Committee to a large extent will have to be confidential. The Committee, I would remind hon. Members, correspond to a similar body which has already been created in France under the presidency of M. d'Aubigny. It was set up by the Ministry of Commerce, and was appointed to consider the routes to be followed in France, the Colonies, and in Allied countries, type of machine to be employed, type of postal car or carrier, bases, relay stations, and the recruitment of the personnel, as well as the question of the purchase of hangars, aeroplanes, motors, etc., for the military authorities. It is only necessary to exercise very little imagination to realise what far-reaching and vast opportunities may offer for the development of the Empire.

[An excellent idea if carried out properly, and if not overweighed by official interference with designs and production.]

AN APPEAL TO CRITICS.

It would be most unbecoming on my part to endeavour, and I do not seek to endeavour, to induce Members to refrain from criticism, . . . but I think it fair to suggest, as regards the Air Service, that criticism ought to be limited in precisely the same way as it is limited with regard to guns, or types of guns, or equipment of any other kind. There really is no justification for thinking that we, as laymen, and we are all laymen, are more competent to criticise aircraft, or the use of aircraft, than we are to criticise types of guns, or submarines, or destroyers.

[A doubtful argument, in that aeroplanes are a new product, and have not always been a Service monopoly.]

The danger is that you will give to the enemy information which it is very desirable that he should learn in one place, and that is in the air. Nobody denies that criticism can have a very stimulating effect, but as regards aeronautics it can have another effect. It can have the effect of reducing, or diminishing or destroying, the confidence of an aviator in the machine which he has got to fly, and there is no more certain way of killing a man than to send him up in a machine which for one reason or another he believes to be unsound. That is one thing which I do think hon. Members should bear in mind in criticising the Air Service.

AN HONEST ADMISSION.

I want to take advantage of this opportunity to modify, or to explain, an answer which I gave to the hon. Member for East Herts (Mr. Billing) yesterday. The hon. Member asked me, as he was perfectly entitled to do, whether a certain type of machine (the B.E.) was used for long-range bombing, and I replied on perfectly competent authority that the machine which they use normally for gun-spotting and artillery reconnaissance was on certain occasions used for long-range bombing. The hon. Member, I think, said, "Are these machines considered fit to send on a long journey?" I replied, "They are considered fit by the officers who send them out." Let me qualify that answer.

It is perfectly true that the officers would not send out these machines if they did not consider them fit for the job, and the proof that they are fit for the job is that they have done it; but I do not deny that if they had other machines they would send them out in preference.

It is inevitable that in every campaign there comes a moment when you do not have to ask, "Is this the best thing for the particular job?" but where you have to use every man and every machine you possess in order to defeat the enemy. My answer to the hon. Member yesterday was not of a character which covered the whole ground, and I invited him not to continue that form of criticism, but to reserve his energies for a subsequent occasion. Is this House going to dictate to officers in the field how they are to use the material sent out to them? You cannot do it. You would then get into the range of operations, and once you do that, you must have absolute confidence in the officers who are in command of our forces in the field, so long as they show that they are worthy of that confidence. The idea that we here can interfere with the use made of the machines we send out is really untenable.

[Army air work must be done. But the people who have given the Flying Services such machines that "if they had other machines they would send them out in preference" should be publicly impeached.]

If the hon. Member or anybody else asks, are we satisfied with the machines we have at the front? I say plainly, No, we are not. We have endeavoured to improve the machines. To go on clamouring for the production of certain kinds of machines in substitution for the machines we have does not help.

[If none had clamoured in the past, we should be further behind than we are now. My dear Major Baird, do, please, study history.]

It is not in the interests of the country to represent our machines as being unsuitable for the work which they are performing, when you know that those machines cannot be replaced at once, when you know that those machines are being replaced as rapidly as can be, and when you know that, however inadequate those machines may be, the duties performed by our Air Services are second to none in the whole field of operations.

The question really is whether or not the work is being done properly. It is our business to secure that the officers in the field shall have the very best material we can produce. [Hon. Members: "Hear, hear!"] That is agreed. All our efforts are made to that end.

[But, meantime, we have paid in flesh and blood where we ought to have paid in brains and machinery.]

I would remind hon. Members that whereas ginger may be a very good thing, they must not think that they are the people who have a monopoly of that very useful article. We have it supplied also from the front. Hon. Members must not imagine that we do not hear of requirements and suggestions from the front as well as from this House. Hon. Members may be quite certain that long before they raise points here with regard to machines, those points have been raised, probably weeks and months before, by competent officers who have visited the front.

MASTERY OF THE AIR.

The only other question with which I have to deal is that of the mastery of the air. I do not know who invented the expression, but it has absolutely very little meaning.

Mr. Joynson-Hicks: I think I did. I have tried to get it for years.

Major Baird: Perhaps the hon. Member will tell us what he means by it. I can tell him that there is no such thing as mastery of the air, for the reason that the air is not only a very big place but that it is getting bigger every day. That is

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explained when you realise that if from being able to get up to 10,000 ft. you are able to get up to 20,000 ft., you have extended the air by 10,000 ft. In that sense it is true to say that the air is getting bigger every day. However numerous your machines or your patrols, nobody can pretend that you can patrol a strip of air 100 miles long and five miles deep in such a way as to make it impossible for the enemy to get through your patrol. It is not wise to endeavour to impress upon people the idea that aerial mastery is going infallibly to prevent any enemy aircraft getting through. The thing is impossible.

[No; but you can make the job so dangerous that only one man in a thousand will attempt it, and that amounts to mastery.]

Therefore, if we should receive visits from the Germans from time to time, we have got to put up with them to a certain extent. It is not fair to lead people to believe that you can give them that protection which they cannot be given. It would be very unwise to withdraw from useful and effective work a number of machines in order to do the work of reassuring people at home. You might have a large number of machines waiting here on patrol duty to meet possible and hypothetical raids, when you know that it would provide inadequate protection and that those machines might be better employed elsewhere.

[On the other hand you can retaliate with such a hell of a raid by way of reprisal that they will never do it again. And that also amounts to mastery.]

What you can do in the air, and what is being done in the air, is to ensure that our men shall enjoy a degree of pre-eminence sufficient to enable them to carry out their duties and to prevent the Germans from carrying out their duties. . . . The men are carrying out their functions. They are not satisfied, and we are not satisfied, with the machines we have got. . . . To have nothing but first-rate machines, which implies their immediate substitution for the machines which are in use, is not really a practical proposition. It does not lead to any useful result and is likely to produce among the pilots a degree of discontent and a degree of lack of confidence in their machines which is not wise.

Let hon. Members remember that, although very good machines may be produced, you will always have to continue to produce large numbers of slow, obsolete machines in order to enable the pilots to be trained. You must bring up your pilots step by step. It is necessary to do what is accepted and well known by competent judges in this matter, namely, produce slow and obsolete machines in order to train your pilots efficiently up to the highest point.

[But why send slow and obsolete machines abroad? Please do not confuse the point at issue. Any old thing does for training, but the best is not good enough on active service.]

Mr. Montagu: My sole object in rising is to say something on only one part of the subject—the part which deals with the supply of machines. My hon. and gallant friend will admit that all through the earlier stages of the history of this matter the Ministry of Munitions gave all possible assistance in its power to the needs of the Air Services, conflicting though they often did with the needs of other supplies.

[Ask some of the manufacturers about their difficulties in getting material and machinery which was lying unused, and yet Ministry officials refused to release it.]

The old system of things was very inefficient and wasteful, and led to the greatest possible delays in the equipment of the Air Services. . . . The whole of the engineering resources of the country ought to have to deal with one co-ordinated authority, which should be responsible for supplying all the needs of the nation. It was for that reason that, during the time I was at the Ministry of Munitions, the whole of those interested in the matter united in their demand that the Navy should not build aeroplanes for itself and the Army for itself, but that we, who had to deal with petrol engines, motor lorries, and with the same firms that were making aeroplanes, should be entrusted with the responsible task for which we thought our organisation fitted us, of supplying everything for everybody.

There was, as my hon. and gallant friend (Major Baird) has said, a great necessity for keeping the user of a machine in touch with the manufacturer and for facilitating production. Design and alteration of design is always tedious and bothersome for the manufacturer to have to put up with.

It appeared likely that friction might arise owing to the difficulty of inter-departmental negotiations. If the President of the Air Board had to write a letter to the Minister of Munitions it had to filter down through his Department, and then a reply had to be sent: "I am desired by, etc., etc." Red-tape and official etiquette might have been preserved by that means, but friction must have resulted, and delays could not have been obviated. The hon. and gallant Member (Major Baird) and the Air Board have found a satisfactory solution of this difficulty. When two or three Departments are concerned in a common work, I think the maxim they ought to adopt is that of never writing letters. If they meet in a room and confer with one another, that is best. During war-time, at any rate, there is no time for writing letters and red-tape.

If the designer and manufacturer are in daily or weekly intercourse with the user of the machine, and sees both or either, all

these difficulties are overcome, and you have a tremendous advantage in the cessation of a conflict between the different needs of the nation from the engineering resources and the raw material supplies of the world. I would say, in conclusion, that I trust the House will consider this, as the months go by, as a precedent for the organisation of the nation. Let us never face a war again—if there be another war—let us never face peace again, with the departmental spirit in the Navy and the Army competing against one another. The Ministry of Munitions began with small things, and, growing from day to day, is beginning to be a Ministry of Supply. I hope such a Ministry of Supply has come to exist as a permanent part of our organisation.

[Provided always that it does not lead us to a Bureaucratic Socialism.]

Mr. Joynson-Hicks: I should like to congratulate Major Baird especially, and the Air Board also, upon the suggestion he has outlined of the new Committee under the ægis of Lord Northcliffe—than whom I do not think one could have a better man, for he has been so keenly interested in flying for so many years—to consider the naval and military and commercial side of flying as soon as the war is over.

Major Baird: The Committee is to consider the civil side of aviation.

Mr. Joynson-Hicks: Still, I am very glad that a Committee is to be formed to consider the civil side of aviation. There is quite enough work in connection with that to provide the Committee with plenty to do for a good many months. At the same time, I hope the enormous advance which is bound to take place in the next few years in naval and military aviation will not be overlooked, and that someone will appoint a Committee, or that somebody will be appointed whose duty it will be to look after that, and not leave us in the parlous position in which we were when the war began.

I do not intend to indulge in any random criticism, nor do I want to indulge in hostile criticism. My hon. and gallant friend has put us in a difficulty in regard to objections and criticism. At the same time, the Parliamentary Air Committee and we cannot be unmindful of the grave anxiety that there is at the present time in regard to certain machines at the front. I will call them A and B. I do not want to mention them particularly, but there is anxiety with regard to the casualties from time to time. Numbers have been kept from us by the Under-Secretary of State for War, but I venture to suggest that secrecy in the House of Commons means publicity outside.

When Lord Cowdray was appointed there was a strong consensus of opinion that we had got the right man at last, and that Lord Cowdray was going to have the real powers of a real Air Minister. I admire my hon. and gallant friend's candour in making the remarks he did in regard to the powers of the previous Air Board. Those powers, such as they were, might be developed into an Air Ministry, and that, at all events, would be a step forward.

I will first of all say what I mean by command of the air. General Henderson stated last week at Birmingham that neither command nor mastery of the air had any existence. On the other hand, I think I am right in saying that General Smuts at Edinburgh stated that we had got mastery of the air. Personally, I agree with General Henderson. I do not think that up to the present there has ever been mastery or command of the air by either belligerent in this war. The object of the Committee and of those of us who have for years been interested in the Air Service is that we should get the mastery or command of the air. What I mean by command of the air is this: we should have in relation to the air exactly what the Royal Navy has in relation to the sea. I leave out for the moment the question of submarines, which is quite a distinct point.

[Is it? Why? Still, Mr. Joynson-Hicks' meaning is perfectly clear.]

But we all know that Great Britain has known for generations past what command of the seas means. We had it at the beginning of this war. We controlled the seas from one side to the other; we swept off the seas all the enemy shipping; we kept command of the sea. I think it perfectly possible for us to have in the same way and in the same sense command of the air. I want to be able to block enemy machines from coming out of their aerodromes. I want to be able to prevent them spotting for artillery. I want to be able to prevent them sending over airships here in order to carry out raids on innocent people. I want to prevent them sending over their aeroplanes here to drop, not very harmful, but unpleasant, bombs on our East Coast towns. I think that is possible if we have such a predominance in numbers as will ensure it.

We have the predominance in men. There is no question about that among any of us. I have never said in any of the speeches I have made on this subject, and I am not going to say this afternoon—I am sure the House will bear me out—one word of criticism of the moral, bravery and devotion of our airmen. That is absolutely beyond any words. They are the super-heroes of the war, and, inasmuch as they are so brave, so brilliant and so determined, it is for us to see that we give them the very best machines that they can possibly have. That I

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suggest is the view which I have always taken and is the view which the Parliamentary Air Committee takes with regard to this matter.

I see my hon. friend the Under-Secretary for War (Mr. Macpherson) is here. What is the position with regard to mastery or supremacy of the air at the present time? On March 7th the Under-Secretary of State for War was asked by my right hon friend the Member for Kirkcaldy (Sir H. Dalziel), "Can he assure us we still maintain mastery of the air on the Western front?" "I think I can make that assurance," said my hon friend. On March 13th he rather modified that statement, "There has not at any time on any side of the Western theatre been a situation which can properly be described as the mastery or supremacy in the air," he said. I am rather inclined to doubt that. I think there was a time when we had the supremacy in the air. If you read the dispatches from France from the Commanders-in-Chief in the spring of 1916 to the summer of 1916 and at the commencement of the Somme offensive in July, 1916, you will see that we undoubtedly had a distinct and total supremacy of the air on the Western front. We had all last summer a distinct supremacy.

We have not the same supremacy on the Western front that we had during the whole summer of 1916. The reason is this. My hon. friend went on to say:

"The War Office is satisfied for the moment with the best types which are being employed, but there are machines still in use of types which are not up to the latest standard. These are being replaced as rapidly as possible."

What does that mean? Our best machines are equal, or superior, to the best German machines. But what proportion of these best machines have we got at the front to-day? I will not give any figures, but I will hazard that we have at the front to day 4 per cent. of our machines of the best type. My hon. and gallant friend will know what I mean by the best type of machines—I mean the ones that the hon. gentleman meant when he spoke on March 13th as being superior to anything of the Germans. Can he or the Air Board tell me that there is any possibility of, I will not say 100 per cent., but 50 per cent. of our machines at the front being replaced by the best type of machine during the course of the coming summer? I am afraid not.

I am afraid it might have been done if it had not been for the confusion and the lack of driving force in the last two Air Boards or Air Committees, or whatever they are called.

Has Lord Cowdray the power that he ought to have? Is he in any degree nearer being an Air Minister? Have we taken a step forward or is he merely in the same position as Lord Derby and Lord Curzon and Lord Montagu were in reference to the previous Air Board or Committee, which I fear were not very much good, in the autumn of last year?

The public believes in Lord Cowdray, firstly, because of what he is, because he has great powers, great organising ability, and great driving powers, but also because they believe he has the power to do things. They believe he is really in control. Let me ask whether he really has any effective control with regard to the Air Services at all?

What do the Air Services consist of? There is the Royal Flying Corps, which is an integral part of the Army to-day. It is under the Army Council. In the last resort it is under the civilian head, Lord Derby, the Secretary of State for War. The Royal Naval Air Service is under the Board of Admiralty. Although we talk of the Board of Admiralty and the Army Council, the First Lord of the Admiralty and the Secretary of State for War are predominant in those Councils respectively, and the First Lord of the Admiralty can override—we had that discussed in the recent Dardanelles Debate—the decision of the Admiralty exactly in the same way as the Secretary of State for War is master of the Army.

Therefore, you have two civilian heads of the two Flying Corps entirely apart from Lord Cowdray as the head of the Air Board.

Then I ought also to mention that the lighter-than-air side has never come under Lord Cowdray or the Air Board at all. They have nothing to do with it, and when we wonder whether we are going to have any Zeppelins to meet Zeppelins, and when, after two and a half years of war, I want to know who is responsible for the fact that we are not able to meet like with like, I am not entitled to go to Lord Cowdray at all. He says it is nothing to do with him, and I have to go to the Financial Secretary to the Admiralty—and ask him why there are no English Zeppelins to compete with German Zeppelins.

Then, not merely are these two Services under separate heads, but there is no interchange between officers of the Royal Flying Corps and the Royal Naval Air Service. I hope and believe that Lord Cowdray and my hon. and gallant friend can act as friendly go-betweens between the Services and modify differences between them, but there is no power to say to this Service, "Do this, and you must do it," or to the other, "You must come in closer touch." They can only say, "We hope you will accept our recommendation and be better friends one with another than you have been in the past."

Then there is the Advisory Committee of Aeronautics, which

has not been mentioned this afternoon, and which, as I gather, is responsible to no one except the Prime Minister direct. Why it should report to the Prime Minister I do not know. That at least might be at once put under the supervision and control of the Air Board.

[Or better still, it might be abolished, for all it has done for the development of aeroplanes or engines.]

Let me go a little further and find out what powers Lord Cowdray has. My hon. and gallant friend has been speaking about a particular type of machine at the front. I will call it the "A" machine. There are three variants of it. Suppose Lord Cowdray and my hon. and gallant friend come to the conclusion, as sooner or later they are bound to come, that that is an inefficient machine for present purposes. It was a valuable machine two years ago. It was an excellent machine at the beginning of the war. Suppose they come to the conclusion, as responsible members of the Air Board, that it is desirable that those squadrons should be brought back, and that the work they are doing is being done at too great cost. They have no power whatever to bring those machines back. They have no power to say to the Royal Flying Corps: "You must send those machines back and even if you do less work you must do it for the moment until we can send you out some newer and better type."

[That is impossible. Army air work must be done, But someone should suffer for mistakes in the Supply Department.]

Or if they come to the conclusion that a certain type—let us call it "X"—is better than anything else, they have no power to say to the Royal Flying Corps or to the Royal Naval Air Service, "We are going to manufacture you this 'X' machine. We are convinced by our technical advisers that it is better than anything you have got, and you must use it." The Royal Flying Corps will say, "No, we do not agree with you. Our technical experts do not agree with yours, and there is no authority whatever in Lord Cowdray over those two Services."

In effect, the new chairman of the Air Board is only an intermediary between the two Air Services and the Ministry of Munitions. He does not even control his own factory. The Royal Aircraft Factory is not under him. He cannot, as I understand it, appoint or dismiss a single man in that factory. That is under the Ministry of Munitions.

Even on the Air Board itself I am not quite sure what the Minister's powers are. Suppose he differs on a matter of principle from General Henderson or Commodore Paine, I do not know that he can call for his resignation as a member of the Air Board. Probably he would have to go to the Prime Minister and get him to institute a fresh Air Board, leaving these gentlemen over, but that would not alter their position as heads of the Royal Flying Corps and of the Royal Naval Air Service. All you would have would be Lord Cowdray as head of the new Air Board with General Henderson as head of the Royal Flying Corps, having had a disagreement on a vital matter with the head of the Air Board, but responsible to Lord Derby as head of the Flying Corps, and not to Lord Cowdray as head of the Air Board.

I suggest that the proper course is to transfer to the Air Board the civil powers of the Secretary of State for War over the Flying Corps and the civil powers of the First Lord of the Admiralty over the Royal Naval Air Service. I do not suggest that Lord Cowdray and his Board should interfere with the tactics of Sir Douglas Haig at the front. Lord Derby does not do so. Therefore, I suggest that their civilian powers ought to be amalgamated in the head of the Air Board, so that even during the war the lines may be laid down on which a great Imperial Air Service may be built up.

Supposing Lord Cowdray and his own immediate advisers come to the conclusion that it is desirable and feasible to do what so many others have asked should be done ever since the war began and have a large air offensive, either at Essen or in the Rhine country, consisting of at least a thousand machines?

An Hon. Member: That is not a matter for the Air Board.

Mr. Joynson-Hicks: That is the position. Supposing they have an idea that it is possible, on the one hand you have the Generals at the front managing their own strategy and their own tactics, and you have the Admirals of the Fleet managing the Fleet and requiring aeroplanes or seaplanes for their Fleet purposes. I am suggesting quite seriously that there is an opening for a third man or a third body such as this Air Board to formulate, while supplying the Army with all it wants in the way of reconnaissance machines, bomb-dropping machines, photographic machines, a new Imperial Air Service, under a new head, if necessary, which would take in hand an offensive which, I suggest, might have a very real effect on the conclusion of the war, which would get behind the German lines in a way that artillery cannot get, in a way that cavalry and infantry cannot get, and destroy, in the German country, the moral which is at present upholding the German forces.

Even if the Cabinet decided that it could be done, there is no Air Service. If he tried to get 10,000 men for the purpose, the moment they enlist they become soldiers and sailors and *ipso facto* under the control of Lord Derby and the First Lord of the Admiralty.

It is no good telling me, "You cannot manufacture the

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machines." Eighteen months ago we thought it could not be done with regard to artillery and munitions, but, owing to the imagination and determination, almost the genius, of one man, the present Prime Minister, who took hold of the Munitions question and turned England into a munition manufacturing area, it was done.

We must be prepared for another campaign in the spring of next year, and now is the time to make your preparation.

When the war began, in August, 1914, there had never been a single aeroplane engine manufactured in this country at all. [Bar those running in the Aero-engine Competition.]

They had all been brought over from France. Someone will hang on a lamp post in Whitehall when the war is over for the abominable neglect of the Air Service and the engine question at that time.

Even after the speech of my hon. and gallant friend, I must say that there are certain machines at the front to-day which are obsolete so far as bombing raids and offensives over the German lines are concerned, which are putting upon our airmen too great a strain, a greater strain than we have a right to ask. Of course the work is being done. The position is that we are responsible for asking ourselves the question, Is the work being done even in war-time at too great a sacrifice? We are responsible.

The Russian Army went into war some little time ago partly armed with broomsticks and partly armed with rifles, and they did very well. They gallantly allowed themselves to be slaughtered, though some of them were only armed with broomsticks. Would it have been right for the Controlling Minister in Russia to say, "Is the work being done?" Would it not have been his duty to say, "Is it right for me to allow these men to go into battle armed only with broomsticks when a little energy and determination might have equipped them properly?" You are entitled to say, not merely "Is the work being done?" but "Is it being done at too great a sacrifice?"

I am not going to say how many of the "A" type of machines there are. It is a machine which is perfectly well known to the Germans as well as to us, which can fly at the outside only 70 or 75 miles an hour in favourable circumstances, and at the outside can climb only 8,000 ft. to 10,000 ft., and it takes from 40 mins. to 45 mins. to go up 10,000 ft., and it has to go into battle with German machines, and it has to go on bombing operations over German lines, where it has to meet squadrons of Halberstadts and Albatroses with an engine-power double that of our machines and a climbing-power of 1,000 ft. per minute, so that it can get up to 18,000 ft. in less than 20 mins., while it can fly at a speed of 110 miles an hour. Should I mention these figures? I hardly know. I am told that if I mention them in this House I shall cause our young men who are flying this machine to be afraid.

Colonel Faber: Not they.

Mr. Joynson-Hicks: Over and over again I have had letters from men at the front with regard to these machines. Here is a letter from a flight commander, a relation of a Member of this House, who has sent the letter to me. It was written a few days ago, and it shows that the men who have to fly know that this is an inferior machine:

"I do not know if you have seen the criticism about the Royal Flying Corps?"

and then it mentions that my hon. and gallant friend said that this particular machine was not sent on bomb-dropping expeditions. He quite admits that that was a mistake, but I have had numerous letters from fliers in regard to that unfortunate statement. Then he goes on:

"This is precisely what they are working it for at the present moment."

This is a man who has done well. He is a flight commander, whose father is a gallant officer in our own Army and a Member of this House. He goes on:

"If from any ill-luck I get 'done in' in a bombing raid, I hope that someone will make a fuss about sending fliers out bombing with those machines, which, as everybody knows, are not fit for the work."

He is willing to go and he is going, and he has fought well.

MORE MURDER CHARGES

The Committee will believe me when I say that there is condemnation from top to bottom, by the men who fly these particular machines, of the policy which sends them to fight these high-power German machines on these expeditions.

Last month another colleague in the House telephoned me, "I have got a young Australian officer from the Flying Corps who would like to see you. I will guarantee him, he is a relation of my own." He came and saw me. I asked him about this particular machine. He said, "If you want to know," and he used an ugly expression, which has been used already in this House, about "murder machines, which my squadron is flying on to-day."

It is better to face these facts. Man after man comes and tells me that. Am I to smother that information? Am I to say, "I am a Member of the House of Commons and will say nothing about it?"

My hon. friend told us just now in his speech that he got this

information months before we got it. I have had that information. The hon. Member for Herts has had that information months ago. Therefore, if he has got it months before we got it, there has been time to clear out those machines altogether, and there has been time to manufacture new machines.

[An absolutely unanswerable argument.]

I had that information six months ago. My hon. friend had it six months ago. There has been ample time to clear out the whole of those "A" machines, but, instead of doing that, even to-day they are ordering that type of machine, and they are ordering them not merely for certain purposes at home, but for use at the front. I admit that they are good machines, stable machines, useful for night flying. But they are not machines that ever ought to be allowed to go over the German lines, and to come into conflict with the enormously high-power German machines.

[But then they are the outcome of our statecraft, our learning, of the best brains in the world.]

We have heard during the last fortnight of the great successes of our Air Service at the front. I admit that it has been magnificent, but the cost has been great. We have not been told the figures of our losses. I obtained them in the same way as the Germans have got them. I obtained them by putting somebody to read through the file of the "Times" newspaper from January 1st to to-day. You Members of the House of Commons are jointly responsible.

[All six hundred, not merely the thirty or so who were present.]

In the casualties in the "Times" reports are included the casualties for both Macedonia and Mesopotamia. I think that my hon. and gallant friend will agree with me that the casualties there in flying are very small. At all events, they would not in any degree alter the proportion in these lists. They also include men and non-commissioned officers who were flying. There, again, the number would be very small indeed—perhaps two or three a month, because nearly all of our fliers are of the officer class. They did not include any accidents.

[Flying accident casualties at the front appear to be entered as "killed" or "wounded," according to results.]

In January there were 56, in February 119, in March 152, and this month up to date there are 319, more than double the figure for March, nearly three times that for February, and nearly six times that for January. There were this very week 117 reported in the paper on one morning.

AN AWKWARD DILEMMA.

I present this dilemma to my hon. friend: Either those men were on the best machines or on inferior types of machines. If they were on the best machines, then I am afraid that the statement of the Under Secretary that our best machines are better than the Germans is rather discomforting. If, on the other hand, you think that they were on inferior machines, then a very heavy responsibility is upon the directors of the Air Service, who sent these men over on these machines which, on my hon. friend's own showing, he knows are insufficient for the work they have to do, and obsolete so far as conflict with the high-power German machines is concerned.

In addition to this, during this same period, the Royal Naval Air Service has lost 121. And at home there have been 73 pilots killed. That is a rather serious toll to take place at home. A great many of them are on a particular machine—not the one I am talking about now—which has been referred to in this House, which I will call "B."

One was killed yesterday in my constituency. Five were killed within the last few weeks in that constituency. Many of them were killed at the aerodrome. After going there all you hear is that this machine is a very dangerous machine to fly. I know that my hon. friend says that one of the leading generals in the Flying Corps has flown it over to France. I know the general in question, and if it were possible to saddle the devil himself, he would saddle him and fly him without hesitation.

[According to Milton, Lucifer is liable to nose-dives or tail-slides, and is not very stable.]

But while he can do these things it does not follow that it is always desirable for young men to follow his example.

The right course is to stop all contracts. When you find machines getting obsolete, instead of taking delivery by the hundred, you should cut with a knife into the contracts, whatever it may cost the country, and, instead of building obsolete machines, build some of the magnificent machines which we know they are turning out.

The new machines are very fine machines indeed. They are sent over with the young men, and men who have been out at the front flying for months are still kept on the old machines, instead of being transferred to the new first-rate machines. In the French Flying Corps, a man goes up from a seventy or eighty miles an hour machine to a 100 or 120-mile machine. With us the men are kept at the old machines, and the new men go out on the new and best machines.

THE OLD MISTAKES AGAIN.

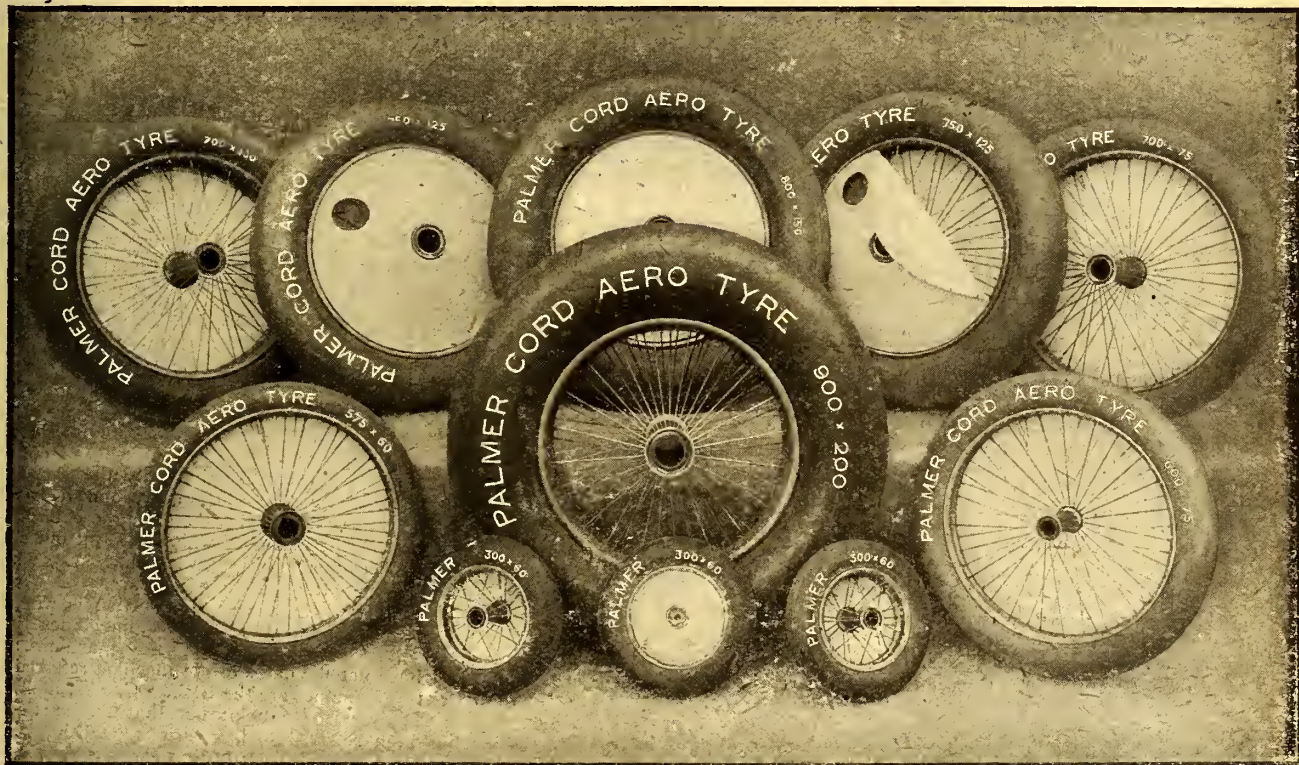
There are not many of these new flying machines. I will call one of them "X." It is a machine better than any German machine, fitted with our newest and best engines, and can climb



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"	17	111.12	25.4	Central	"	*80	178.	31.75	132/46	"	33	150.	40.	Central
450×60	30	72.39	12.7	Central	"	*91	178.	44.45	132/46	"	66	150.	38.09	Central
575×60	14	89.	31.75	Central	"	*98	178.	31.75	132/46	"	96	178.	38.89	132/46
"	21	150.	38.09	104/46	"	2	178.	44.45	Central	"	8	178.	55.	132/46
"	34	160.	28.	Central	700×100	4	185.	55.	135/50	800×150	10	185.	55.	135/50
650×65	9	150.	31.75	104/46	"	18	178.	55.	Central	"	36	185.	55.	Central
"	20	178.	44.45	132/46	"	26	150.	40.	Central	"	40	185.	60.32	135/50
"	75	178.	38.09	132/46	"	33	150.	38.09	Central	"	42	185.	60.32	125/60
600×75	14	178.	31.75	132/46	"	66	178.	38.89	132/46	900×200	47	185.	55.	125/60
"	21	150.	28.	Central	"	96	178.	55.	132/46	"	97	250.	65.4.	Central
"	34	150.	31.75	104/46	750×125	2	185.	55.	135/50	1000×150	52	185.	55.	116/69
700×75	9	178.	44.45	132/46	"	4	185.	55.	Central	1100×200	57	185.	55.	Central
"	20	178.	38.09	132/46	"	18	178.	44.45	132/46	"				

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and fly faster than the German machines. A squadron of these machines was sent over. There is no harm in telling the House how Capt. Robinson, V.C., met his fate, whatever that fate may be. A squadron of these machines was given pilots most of whom had never been over the German lines at all. They were practising flying up and down behind our lines, and afterwards sent for a short distance for one day. Then six of them were started off for a long patrol over the German lines, and these included Capt. Robinson. Out of that six one got back to our aerodrome all right, one got back just safely behind our lines, and four either came down or crashed down behind the German lines, and the Germans have got those best machines now. Surely those machines ought not to have started. You ought to have waited until you had got three or four squadrons ready to go over.

It is like the old tanks over again. Instead of waiting for a lot and crushing the Germans, they sent six machines over and they were met by nobody knows how many German machines, and, as I have said, four out of the six were brought down.

[And what about the "de Havilland Fours"??]

I hear on all hands that there is much anxiety in regard to our flying machines. The whole secret of the matter is engines, engines, engines. Last week I met six of the principal aeroplane manufacturers in this Kingdom, and they told me they could turn out, and were turning out, as many machines as you like of the best and highest type, but they could not get engines for them.

The engine position was known. It had been spoken of in this House. There is no essential difference between an aeroplane engine and a high-class motor engine, and the manufacturer who builds one can build the other. Years ago arrangements ought to have been made to build these high-class engines.

Ask any manufacturer of engines you like—I will not mention any names—how they have been treated in regard to the manufacture of engines, and whether they have been given sufficient orders months ago, as they ought to have been.

[But then we were waiting for the products of our statecraft and learning at the R.A.F. Ask General Henderson.]

But are proper plans being laid down for the necessary engines, or are constant tinkering alterations being made to the engines? A Member of this House said he was manufacturing a certain part of one of our new and best engines, and that he had been doing it for three months. The week before last an alteration of a $\frac{1}{2}$ in. was made in regard to a certain portion of it; and I asked him what would be the result. I said, "Will it mean a fortnight's delay?" He said, "The result will be three months' delay!" Why was not that thought of before? Why was not that design made sufficiently correct before?

REPRISALS.

I want to congratulate the Government on the reprisals which took place a fortnight ago at Freiburg. But if you are going to have reprisals you must be thorough. You must have an offensive Air Fleet apart from the everyday requirements of your Army. You cannot take your machines from Sir Douglas Haig at the time of a big push. You must have an independent striking force, and I hope the time is coming when such arrangements will be made that every time there is a Zeppelin raid over defenceless towns in this country, every time a hospital ship is torpedoed, every time a merchant ship is torpedoed without notice, every time the German Army commits a breach of the civilised usages of war, there will be a reprisal, swift, sudden, and determined, on German territory behind the German lines. The time has come to take off our gloves in this war.

When the Secret Session comes I will give my hon. and gallant friend and the House a lot more information. I will read a lot more letters, and I will tell him of more interviews I have had.

While our men are what they are, with their superb gallantry, their determination, their bravery and their fearlessness, it is the duty of the Air Service, and it is the duty of the House of Commons, to see that they are provided with the very best machines brains can devise and hands can manufacture.

Lord Hugh Cecil: I am not able to speak on the question now before the Committee with anything but very slight information.

[As is obvious from later remarks, so why speak at all?]

I listened to the speech of my hon. friend (Mr. Joynson-Hicks), as the whole Committee did, with great interest and sympathy for the earnest desire that he always shows to make the lot of the flying officer at the front, supported by intelligent criticism at home, as good as it can be made. . . . When my hon. friend came to deal with the practical evil which he alleges to exist, it amounts to one, and that is that the machines used at the front are not sufficiently good. That is the fault of the Supply Department. If such fault there be, the fault lies with the very Air Ministry the power of which the hon. Member is anxious to increase.

[Bosh! The Air Board is not responsible for ordering B.E.s. last year, when it did not exist.]

My hon. friend is anxious to meet Zeppelins with Zeppelins. I thought that of all the successful things in Home defence the resistance of Zeppelins by aeroplane had been most notable. So far as that criticism goes, surely the hon. Member is carrying

criticism rather too far when he complains of our Home defence against Zeppelins.

Mr. Joynson-Hicks: My point is the question of the demands of the Fleet in regard to aeroplanes and the great use Zeppelins have been in naval battles?

Lord H. Cecil: That is another point. I understood my hon. friend to be dealing with the question of Home defence against Zeppelins, which has been one of the things that has been very well done. With regard to the hon. Member's suggestion as to sending a large number of machines over German territory, that is not a question upon which the opinion of this Committee can be a really valuable one. If ever there was a question which is a technical military question, it is this question as to sending a vast number of military aeroplanes to make an attack upon Germany, and in regard to that technical question the opinion of this Committee is not worth much.

[On a question of the moral effect of such raids on a civilian population the opinion of the shopkeepers in the House of Commons is worth as much as that of the G.O.C.-in-C.]

The main difficulty is not so much the supply of machines as the supply of pilots for these expeditions. A pilot takes a much longer time to make than a machine. I do not know whether they have got quicker now, but a year or two ago it took from three to five months to train a pilot.

[Not merely to act as chauffeur on a bomb-dropper.]

If you were unfortunate enough to throw away three or four hundred pilots in this way it would be a serious hindrance to your operations for some time to come.

[No, it would not; because they should be merely Air Service pilots, and not trained aviators of the Regular Army.]

Then we come to the question of obsolete machines. I do not think you can prove anything merely by dealing with casualties. . . . You cannot say because in a number of cases aeroplanes are brought down over the German lines that it shows that that type of aeroplane is not the best. The mere fact of casualties happening shows that you are using the Flying Corps with more enterprise and energy.

[So, if everyone is killed, that is the supreme proof of enterprise. Eh! Lord Hugh?]

I understood my hon. friend to argue that only the very best machines should be sent out on hazardous duty, and it is certainly obvious that the better the machine the safer the enterprise. If I am correctly informed, the machines which are sent out upon raiding expeditions are accompanied by fighting machines, which are supposed to guard the attacking aeroplanes.

Mr. Joynson-Hicks: The whole part of the question is whether the protecting machines are as good as the best machines there are in Germany. We have not sufficient protecting machines.

Lord H. Cecil: I have not the name of the machine referred to.

Mr. Joynson-Hicks: The names are the B.E., 2 C, 2 D, and 2 E.

Lord H. Cecil: I only wish to point out that the particular machine which has been referred to has various qualities which should be taken into account. It is true that the machine is not so fast as many a more modern machine, and it is true that it has not the quick-climbing qualities of other machines, but it is a very easy machine to fly. Let me take an illustration. We are sometimes told that a horse is a "confidential animal," and his aeroplane to which I refer may be described as a "confidential aeroplane." It is easy to fly, and puts less strain on the attention of the pilot. That is a quality of an advantageous character, because the eye of the pilot is not being constantly called to his machine when he has other things to claim his attention. There are machines which fly faster, but they are not so easy to handle.

[On which analogy Lord Hugh would like to ride a lady's hack in a cavalry charge. Forbye there are machines doing well over 100 miles an hour which are much easier to fly than any of the B.E. series.]

I think my hon. friend is a little too hard in his criticism of the machine. He said it would only go seventy-five miles an hour, but my recollection is that it goes between eighty and eighty-five an hour.

Mr. Billing: What height will it climb?

Lord H. Cecil: That I cannot say. I flew the machine on the level, in still air.

[Before this gentleman sets up as an advocate he had better go and fly a B.E. with full war load after it has been a month at the front.]

I have often had the idea that when members of the Flying Corps are at all depressed and out of spirits, they should write to the hon. Member for Brentford (Mr. Joynson-Hicks). Large numbers of the officers of the Royal Flying Corps are very young men, but I would venture to repeat an observation which has been made, that the root of human progress is to be found in the criticism and ideas of young men under twenty-five years of age. At that period of life young men are almost always very critical, and it has been said that the ideas, beliefs and criticisms of young men under twenty-five, ten or twenty years later, become realised; and we may assume, therefore, that the young man's conception of what the ideal aeroplane ought to be will be realised ten or twenty years hence.

[The active-service pilots' ideals can be realised to-day. Anyhow, I would rather shape my course by the criticism of a young fool than by the complacent satisfaction of an old one.]

I think that if we could get into the minds of the German General Staff we would find that there is nothing for which they envy us more than our Air Service, and they consider that we have nothing which is better and more efficient.

[Please distinguish between efficiency of personnel with indifferent material and possible effectiveness with the best possible equipment.]

Mr. Billing: The noble lord spoke of the B.E.2C, and I think what he said was substantially correct. "It is a machine which 1, months ago, described here as the "murder" machine. With this machine, if the pilot is an engineer, and in sympathy with his engine, he might possibly obtain 75 miles an hour, but when it is sent out before very long it is found that the speed goes down to something like from 62 to 68 miles an hour, and in some cases even lower. When going on bombing raids the machines cannot carry a passenger, because they have to have the weight of the bombs. They go in batches, or squadrons, and are convoyed by fighting machines, but they have great difficulty in keeping in touch with the convoy, some of which circle away to the right and some to the left. In a case of that kind, with these convoys the Hun has a simple trick for dealing with them, and it is very difficult to stop him doing it. While our machines have been spending 50 minutes getting to an altitude of 6,000 ft., some of the better machines of the enemy get up in from 3½ to 4 minutes. Those pilots get up about 18,000 ft., and dive on at least one of those bombing machines, or perhaps two of them. The result is that the fighters go out in front in order to get those two enemy machines down. What are the bombers going to do with their speed of about 62 miles? They plod along and hope for the best. The convoy engages with the two chance machines, confident that they will be able to catch up with the bombing party. Before those fellows have got on about two or three miles there are two or three more Huns at a height of from 18,000 to 20,000 ft. Directly they see the convoy drawn away by the first two pilots, down they come and shoot those other fellows down.

That is the point I want to make—to try and get them to

stop sending over those fellows in that type of machine. It has taken me 13 months before any Member would get up to support me on that point. I used the word "murder" 13 months ago. It is all very well for the noble lord to make a joke about a pilot having nothing else to do and so writing to my hon. friend. It is a most unseemly remark.

Pilots think quite differently from that. I have had four letters this week, signed by pilots, and fellows who fly these machines call themselves the Suicide Club.

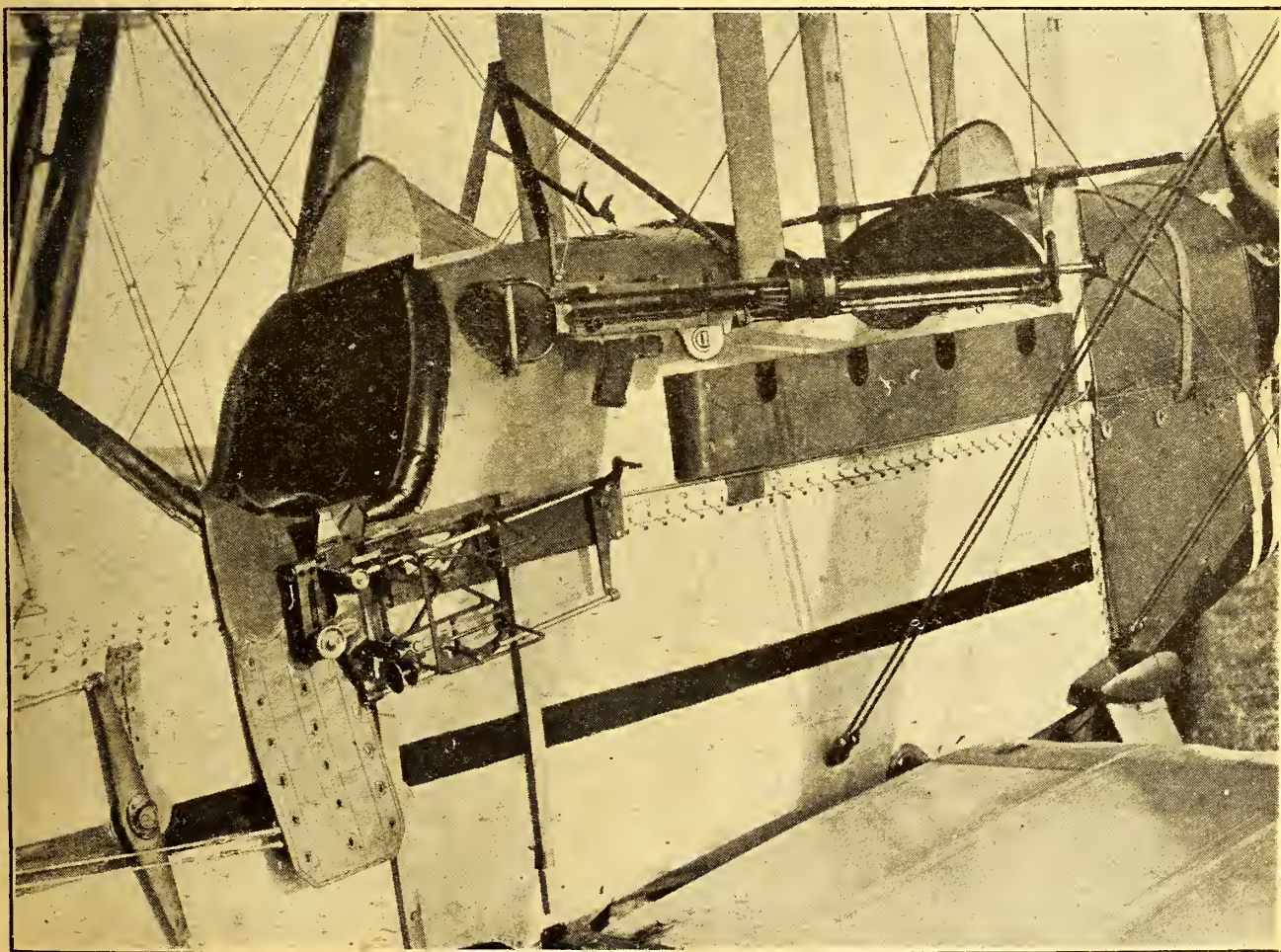
It may be a very sound thing so far as the administration is concerned for a member of the Government to stand up and say that it is not in the interests of the country to criticise, and that you must not give information to the enemy. The agitation that took place 12 or 13 months ago resulted in alterations and, in fact, it provided the hon. and gallant gentleman with the position he now holds. If it had not been for that agitation there would have been no Air Board, and we should have gone on in exactly the same way.

I do not say that the Air Board is perfect. I have considerable confidence in the ability of the Chairman to do a very great deal, and, anyhow, it is in the right direction. I have no grievance against Sir David Henderson. I have no grievance against any particular person, but the difficulty in criticising a Service without mentioning the responsible head of the Service is just the same as criticising a Department without mentioning the responsible head.

It has always seemed to me a rather deplorable thing that criticism in this House, to be of any use, must naturally and necessarily be what one might call destructive criticism. There are times when the spur of destructive criticism is the only thing that official apathy will feel.

A STRAIGHT QUESTION.

I would ask the hon. and gallant Member one very distinct question—namely, if the Chairman of the Air Board, assuming that he has the authority, if certain Members here can produce evidence to him which cannot be contradicted that these machines are totally unfit for this purpose, will he give orders that these machines are not to be employed any further in France for bomb-dropping behind the enemy lines? He might limit their activities to gun spotting and other observations of that kind.



From a Photograph taken at the German Aeronautical War Trophy Exhibition, and received from a Neutral Country. An Officially Designed Standardised British Biplane in the Hands of the Enemy. The External Gadgets in the shape of ammunition racks, bomb sights, gun mountings, elevator levers, and so forth will interest students of head-resistance and those who are surprised that the products of the "Best Brains" should lack speed on active service.

If he will not grant that, will he say this, that no further machine of this type shall be sent from England to France to be used for this purpose?

If that is too much to ask him, will he see that no further machine of this type shall be ordered now to be built in the future and to be delivered in six months' time in France at the front?

From information I have in my possession I am satisfied that that is what is now being done at present. They are ordering these machines. If they are so hopelessly inadequate, out-ranged and inefficient to-day, how much more likely are they to be so when delivered in six months. I would like him to give an assurance to the men at the front that when they are through with this lot of machines, if they are necessary for the efficiency of present operations, they will not continue to be sent over.

I do not think that any Member of this House can say that they had not fair warning as to what would happen to the pilots if the ordering of these machines was persisted in. Twelve months ago I mentioned the matter. It is perhaps poor satisfaction to suggest that one has told anybody inside or outside this House, but they had fair warning of what was likely to happen if they persisted in ordering these machines, and the result we have seen.

The hon. Member above the Gangway raised another point, in which I think he was a little misunderstood. That was the question of the men flying better types of machine, of which he gave an instance. It is not always because a man is on the worst type of machine that he is at a great disadvantage, or because he is on the best. I do not want to give the House the number of pilots that went out four days ago, but a vast number of those men had not sufficient experience, and I appeal to the hon. and gallant Member to use whatsoever influence he may have with the authorities to see that those men are thinned out when they get out there, and not sent over the lines until at least they can have some chance to use that bravery which we are all so busy praising in this House. If these men were not so brave and so full out you would hear a great deal more about it, but it is because they are so full out that they put up with these inefficient machines.

THE R.N.A.S.

The hon. Member for Brentford also raised the question of a sustained air offensive, and I would like to suggest to the Air Board that there has existed for a long time an opening for a sustained air offensive quite independent of the requirements of the Naval and Military Wings. The Naval Wing was formed, in the first instance, to provide the Grand Fleet with machines for gun-spotting and observation and to assist the Grand Fleet in operations on the High Seas, but the Royal Naval Air Service has never fulfilled its functions. It has never yet been able to produce anything that was really of any material use to the Grand Fleet.

The result has been that it has been used in many instances to devil for the Royal Flying Corps. When the Royal Flying Corps have been weak in any place we have sent them a squadron of Royal Naval Air Service machines. I think the members of the Royal Naval Air Service at least do not think very highly of that, although they are quite willing to do it.

I can assure the Committee that there are a vast number of machines now in this country, despite our losses at the front, under the administration of the Royal Naval Air Service, both stored here and being taken delivery of. If these machines are in the country and the pilots, surely they can be put on some useful work. It has been suggested that to initiate one reprisal raid and then stop is a bad policy, and I quite agree.

What is responsible for the apathy in the administration of the Royal Naval Air Service? One thing it is doing—it is using up an enormous amount of the output of this country and arresting an enormous amount of facilities which might be used to advantage for the Royal Flying Corps. When we have an opportunity in Secret Session I should also like to know whether the Financial Secretary to the Admiralty will be so good as to tell us how much of this country's money has been spent on developing the Royal Naval Air Service since August, 1914. I think it is out of all proportion to the value that the Service has been to the country, although it is not out of all proportion to the value the Service might have been to the country.

AMERICA.

I had occasion last week to ask the Prime Minister what our attitude towards America on the question of the production of machines was likely to be? We all know that the American mechanical resources for the building of aeroplanes are limitless; if any resources are limitless, they are in the United States. It is some weeks now since the Americans came into this war, and yet, I understand, we have absolutely refused to give them access to our designs or to our latest types of engines, owing to some commercial cause. I am confident that the constructors in this country would be willing to meet the American Government and supply them with the very latest types of our machines, and I quite fail to see why we should not supply the American Government with the latest types. It would be quite possible for the American nation, without any great strain on their resources either of personnel or of material, to raise 5,000 or 10,000 bomb-dropping machines in the next six or eight months.

I think it is also feasible that they might be able to provide pilots for, at least half that number, which would be a very fair average to allow for crashes; and I think, if this war does continue through this year, as it seems likely to continue, it would be a very useful thing for the Allies if the Americans could put from 3,000 to 5,000 bomb-dropping machines on the Western or on the Eastern front early next year. The effect of raids carried out on a vast scale, as they could be carried out, without any trouble to ourselves or any drain on our resources beyond supplying America with the drawings and specifications and possibly one or two (sample) machines to help them through the initial stages, would be incalculable. But it wants to be done now. We do not want to talk and haggle about it in the middle of December and then say, "I think it is time to do it," with the result that the machines will not come along until the following winter. It seems to me that in this matter of America, also, time is absolutely of the essence of the contract.

Possibly it will be fair for me to say that the officials of the Royal Flying Corps and of the Royal Naval Air Service are not so much to blame in these matters as what one might describe as the political interests at the head.

AIR RAIDS.

The chairman of the Air Board should ask himself three simple questions. The first is—What damage both to material, and, what is more important, to the moral of the enemy, can be accomplished by striking at him from the air behind his lines? It has been suggested that the chairman of the Air Board has not the authority to do anything in this matter. Then I commend it to the Parliamentary Secretary to the Air Board to pass these suggestions along to whoever may have the power. He should then ask himself, What types of aeroplanes is it necessary to construct to accomplish this thing? And thirdly, What steps is it necessary to take to enable us to standardise production and produce the necessary quantities in order to make an air offensive effective?

It is possible to turn them out providing that you have a policy, but if you have no policy you cannot standardise. Assuming that we were contemplating a big raid on Essen in six months' time, and continued raids on other parts of Germany, it is possible to standardise a bomb-dropping machine for the next six months. Not only is it possible, but we have the type now. It is quite an extraordinary thing, as we had it in existence twelve months ago. If the authorities standardised that kind of machine for six months, and put 1,000 in hand, and then put in hand the training of the men to fly these machines, in six months, or in three months' time, it would be well.

Then it comes to a question of providing fighting scouts to accompany them. That is a thing you cannot standardise. I would suggest that orders for that type of machine should not be given at a maximum of more than one month's output to any firm who took it on. Provided that a firm is given an order at twelve or fifteen machines a week for sixty of them, which will represent a month's output, then at the end of that time you could standardise that type again with the improvements that the month's air flying had taught, and that machinery could go steadily on.

We could arrange the delivery and the commissioning of the pilots to synchronise with a definite policy in hand, and these raids could be commenced. All this could be done without interfering in any way with the output in this country for naval and military requirements, providing that which is asked for the naval and military pilots is limited to what the Army and Navy is justified in asking for.

It has been suggested that the Admiral of the Fleet or the Field Marshal in France should be responsible for arranging these raids. That is a false policy. It is quite possible in conference with a Secret Service officer and a map to plan any number of raids, where they shall be initiated, and where they shall take place. I say that this could be done without interference so far as either naval or military requirements are concerned.

Not only that, but if the material which the Royal Naval Air Service at present are not employing was taken over it would form a very considerable nucleus for such an Imperial Air Fleet or raiding squadron. I think the operations of the force I suggest want to be absolutely distinct from the Army and the Navy.

The only interest that Sir Douglas Haig would appear to have in the matter is when he gradually found his Army opposing an army with a weaker moral, which would probably continue to decrease in proportion to the increase in our raids.

THE BRILLIANT FUTURE.

I should like to congratulate the Government on the recent changes and promotions in the Royal Flying Corps. I consider the new system of a Deputy Director-General one of the happiest appointments that has been made for a long time. The promotion, too, of several other officers is likely to have not only far-reaching, but immediate, results in many cases which hon. Members have felt it their duty to bring before the House. I at least have a great deal more confidence in the future of our Air Service.

(Continued on page 1145.)

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The British Aircraft Industry.

BY CHARLES L. FREESTON.

(Founder Member of the Royal Aero Club.)

XIV.—THE BLÉRIOT AND SPAD AIRCRAFT WORKS.

Essentially typical of the community of interests in the aircraft world under present conditions are the Blériot and Spad works at Addlestone. Here we have a British-built factory and British labour engaged on the building of aeroplanes of French design, and fitted with engines designed in Spain, but manufactured in England and France. In the way of further detail as to what is actually being done at this compact and particularly up-to-date factory, it is, of course, impermissible to speak, but it is no secret to the Germans that the Blériot-Spad fast fighting machines in the hands of Guynemer and other redoubtable pilots have proved themselves to be "engines of war" of the most formidable type, while the design and construction of the Hispano-Suiza engine have already been fully described.

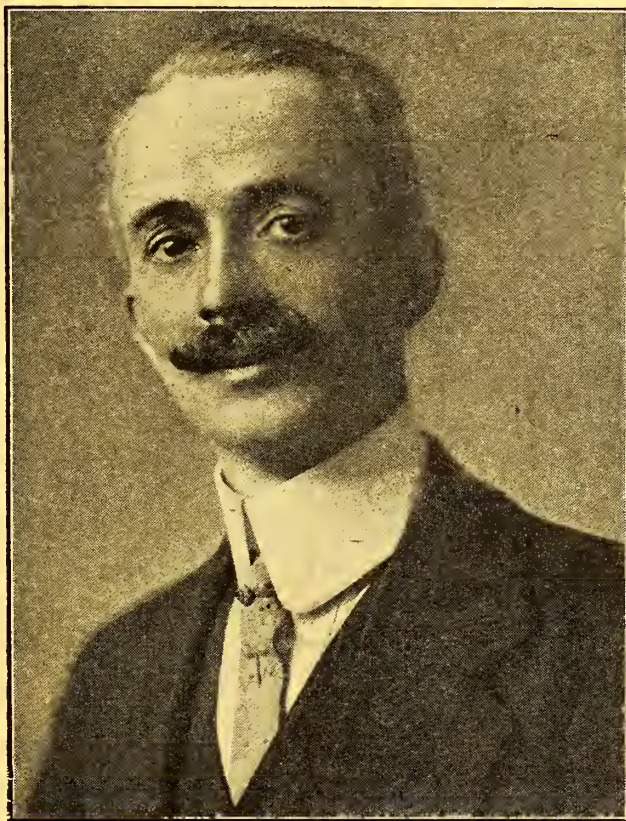
A NEW TITLE.

It may be mentioned, however, that in a short time the firm will no longer be known as "L. Blériot, Aeronautics," but as the Air and Navigation Co., Ltd., a new title to that effect having already been registered, though formal permission to trade under that name has not yet been received from the Board of Trade. The present general manager of the firm is Mr. Norbert Chéreau, who will be managing director of the new concern, with a large interest in the business.

AN OLD FRIEND.

Mr. Chéreau has been a familiar figure in Anglo-French sporting circles through three distinct eras. As the London representative of the Paris daily "L'Auto" in the cycling days, he was well known at the Herne Hill, Crystal Palace and other racing tracks, and when motoring came in he continued with sporting journalism the London agency for the Blériot lamps.

It was thus, of course, that his long connection with M. Louis Blériot began early in the 'nineties; and incidentally it may be remarked that had there been no Blériot lamps there would have been no Blériot monoplane, for it was the fortune made in this branch of motoring commerce that the famous pioneer sank in long years of patient experimentation in the new dominion of the air. The amount which he was stated to have lost by his researches, if I recollect rightly, before he achieved success with the memorable crossing of the Channel in 1909, was no less than £60,000.



Mr. Norbert Chéreau.

THE HENDON SCHOOL.

It was so far back as Jan., 1910, that the Blériot machine became acclimatised in this country by the establishment of a school and agency at Hendon. The aeroplanes were built, of course, in France, but the final erection was done in the shed at Hendon. Numerous pupils were taught to fly there during the next four years, and just before the war a contract had been made with the War Department to train all the officers of the reserve of the Royal Flying Corps. This scheme, however, was nipped in the bud by the actual declaration of war, and the Government took over the school and the stock of machines alike.

A START AT BROOKLANDS.

Long before that unexpected consummation, however, Mr. Chéreau had been endeavouring to induce his chief to start building in this country, but it is not surprising to anyone familiar with the state of the aircraft industry in 1913, where Government recognition was concerned, that M. Blériot was not hypersanguine on the all-important subject of "orders."

However, in 1914 he did assent to the erection of a small factory at Brooklands, with a potential output of some fifty machines a year. In a sense, therefore, the firm was prepared when the war broke out. The Brooklands' works are still used as the final erecting shop for the machines built at Addlestone, as it adjoins the aerodrome and facilitates the testing process. The factory at Addlestone was designed by Mr. Chéreau himself, and he is justifiably proud of the fact that it has earned high praise from Government inspectors and others who have visited it officially. In the work of organisation, both at Brooklands and Addlestone, Mr. Chéreau has been very ably seconded by

Mr. A. Davidson, his works manager, who has been with him since 1914.

THE BIG RACES.

It is almost superfluous to remark that for a long period the Blériot machine was at the forefront in this country, as the result of the memorable crossing of the Channel by the pioneer himself in 1909. Many of our pilots learned to fly on Blériots, while several British firms adopted the monoplane as a standard type, in preference to the biplane, and never departed therefrom until the war itself.

—Even when the Blériot had appeared to have lost its abso-

lute pre-eminence, moreover, owing to the variety of other machines, both monoplanes and biplanes, which had come into being, fresh laurels were gathered by the successes of Lieut. de Conneau in the Circuit Européen and the Circuit of Britain contests. The former was begun on June 18th, 1911, and completed on July 7th, in 58 hrs. 38 mins., or 24 hrs. 18 mins. of actual flight for a distance of 1,060 miles, the course ranging from Paris to Liège, Utrecht, Brussels, Roubaix, Calais, Dover, Brighton, London, and back through Brighton, Calais, and Amiens to Paris.

The Circuit of Great Britain race followed on July 22nd, and finished on July 25th, the course being from Brooklands to Hendon, Harrogate, Edinburgh, Sterling, Glasgow, Carlisle, Manchester, Bristol, Exeter, Brighton and Brooklands, and Lieut. de Conneau's official time was 22 hrs. 26 mins. for 1,005 miles.

AN EXHAUSTED HERO.

Mr. Chéreau was in sole charge of the Blériot interests during the English stages of the Circuit Européen and throughout the contest which followed, and his task was no sinecure, particularly in the later event. For four days and three nights he never saw a bed, but was continuously travelling by road or rail. His most anxious time was when Lieut. de Conneau arrived at Brighton in a state of such exhaustion, after passing through a storm of hail, thunder and lightning, that he declared, "I am finished! I cannot go any farther! My arms are simply paralysed, and I cannot hold anything on my machine."

The autograph hunters and amateur photographers were chivied off, however, and the pilot was put to bed, where he was massaged by Mr. Chéreau until his fingers were numbed. Then he went out and found a doctor, who continued the process with the result that Lieut. de Conneau recovered his spirits and decided to go on.

LONDON TO PARIS.

Another event, which was arranged by Mr. Chéreau from this side, was the London to Paris flight in 1910 by M. Prier, who is said to have been killed at the front. Mr. Chéreau had a machine specially built for the performance—a single-seater with a 50-h.p. Gnome engine. The journey from London to Issy was covered in 3½ hrs. Prier had to work round London by way of Canning Town in order to avoid the embargo on crossing the capital, and was provided by Mr. Chéreau with a map on which were marked such prominent buildings as the Alexandra Palace, Dover Castle, etc. Prier only made one mistake on the whole journey, and that was in going too far west near Rouen. However, he travelled so fast that though Mr. Chéreau sent a telegram to the Blériot people in Paris, who set off at once in a cab for Issy, they found on arrival at the aerodrome that Prier had already arrived.

LAND YACHTS.

Mr. Chéreau also took a prominent part in M. Blériot's experiments at Hardslot with land yachts, or "aeroplages," on the sands. These craft, as a matter of fact, put up some respectable performances, and over two hundred have been built, three of them being for the "Daily Mail." They were used for advertising purposes at various popular resorts, the proceeds of the passenger rides being devoted to a local charity.

AERIAL PROPULSION.

Another and important side-line of Blériot activities was concerned with aerial propulsion for vessels of light draught in shallow waters. At the time the war broke out this branch bade fair to assume considerable proportions, a hundred boats being on the point of being laid down. The engines varied from 50-h.p. to 200-h.p., with single or double air propellers, the hulls being built with stepped bottoms, after the manner of a hydroplane, the object in this case, however, being to pass over the patches of grass which are plentifully found in South American rivers.

A VICKERS MARRIAGE.

PIERSON — LLEWELLYN-JONES.—On Thursday, April 26th, Mr. Reginald Kirshaw Pierson, eldest son of the Rev. Kirshaw Thompson Pierson, of Hastings, was married at St. George's Church, Harrow Square, to Dora, eldest daughter of Arthur Llewellyn-Jones, of London.

Mr. Pierson occupies an important position in the Aviation Department at Vickers, Ltd., his connection with the firm dating back to the year 1907. He joined that department at its formation in the year 1912, and has been intimately associated with the design of the various machines turned out by the firm from the original gun-carrying biplane to those of the present date.

Mr. Pierson is probably one of our youngest designers, and is also a practical pilot, having taken his certificate at the Vickers School in 1913.

His early engineering training was obtained at the Erith Works of Vickers, Ltd., in 1911. He obtained his B.Sc. (Lond.) in 1916, was elected an associate member of the Institution of

Such aerially propelled craft as had already been built before the war proved very successful, and one of them carried no fewer than 40 passengers, and was capable of considerable speed. It may be inferred that it is in view of post-war developments in this direction that the title of the firm is to be changed to the Air and Navigation Co., as mentioned before.

A GREAT CAREER.

It is, of course, impossible even in an article dealing with the British side of the Blériot organisation to avoid reference to the career of the great Louis Blériot himself. It is one which Britons themselves may well admire, for it was characterised by the quality, above any other, of tenacity of purpose.

M. Blériot, indeed, began his aerial researches so far back as January, 1901, when he produced a little aeroplane with flapping wings and a motor driven by carbonic acid gas. Of course, it carried its own weight only, but flew quite nicely.

From that time onwards M. Blériot's experiments took many forms. He ran an aerial hydroplane on the Seine, for example, in 1904, and a second example in 1905. Each alike was designed on the box-kite principle, though the earlier one had elliptical wings. Double floats were fitted.

AN EARLY MONOPLANE.

In 1907 he produced a quaint monoplane in which the wings were set at a very pronounced dihedral angle, while the tail, which was very large, was also arranged in similar fashion.

M. Blériot may also claim to be the originator of the folding wings, for it was in the same year that he brought out a machine embodying that idea.

HIS FIRST FLIGHT.

His first actual flights were made in July, 1907, and on Sept. 17th of that year he was awarded the medal of the Aéro Club de France for the first officially controlled performance on a monoplane, when he covered the colossal distance of 184 metres!

By the following August, however, he had so far progressed as to cover 10 kilometres in 8 mins. 24 secs. at Issy, and on October 31st he made the first out and home cross-country flight, from Toury to Arthenay and back, and thereby won a prize offered by the President of France. The distance each way was 14 kilometres, and the conditions required that the aviator should land at Arthenay and re-start his machine unaided.

The machine on which this performance was made, it is interesting to note, was of the same type as that on which he subsequently crossed the Channel.

THE CHANNEL CROSSING.

As for that famous event, the flight from Calais to Dover on July 25th, 1909, it is easy nowadays to regard it with comparative indifference. Judged by the period, however, at which it was made, it may legitimately be described as the most epic event in aviation history. The vast strides that have been made in aviation science during the present decade do but emphasise the courage of M. Blériot in launching himself into the chill air at four o'clock in the morning, trusting his life to a motor that had never previously been known to run for as long a period, over land, as was necessary for the voyage from shore to shore.

This, in fact, is the criterion by which to appraise M. Blériot's effort. The Channel is crossed many times daily in the air nowadays, but lightly as the journey may be regarded from the flying point of view, who is there who would dare to attempt it behind a 25-h.p. Anzani? The wiser we have grown, and the more wonderful the machines that have been designed since 1909, the more we may marvel at, instead of disparage, the pluck which M. Blériot so signally displayed.

As for the educational effects of the performance, they were immediate, incontestable, and far-reaching. A stimulus was given to construction and to the art of flying alike such as no other single event has ever produced.

Civil Engineers, and is also an Associate Fellow of the Aeronautical Society of Great Britain.

To commemorate the happy event, the members of the Design Staff, presented him with a solid silver tea-set, the presentation being by Mr. H. Stafford O'Brien, the chief draughtsman.

All wish Mr. and Mrs. Pierson every happiness.

THE INSTITUTION OF AUTOMOBILE ENGINEERS.

The eighth meeting of the session of the Institute of Automobile Engineers will be held on Wednesday, May 9th, 1917, at the Royal Society of Arts, John Street, Adelphi, W.C., at 8 p.m., when Mr. A. W. Reeves will read a paper entitled "Works' Organisation."

An invitation is extended to all those interested in the subject to be present at the meeting and a card of invitation may be obtained by forwarding a stamped addressed envelope to the Secretary, Institute of Automobile Engineers, 28, Victoria Street, London, S.W.1.

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NOTES ON THE TRUING OF AEROPLANES.

BY "ALPHA."

The truing of an aeroplane is a matter more of common sense than mystery, but it must be borne in mind that care and accuracy are absolutely essential. Different types of aeroplanes necessitate different methods of truing, but they are all based on fundamental lines which will be explained in this article.

horizontal both longitudinally and transversely. The lengths of the struts and the spacing of the strut sockets should be checked.

Points should be taken at the tops and bottom of the struts as shown by A, B, C, D in the illustration. The points must be on the centre line of the struts and preferably equidistant from the centre line of the body, although the top points need not be equally distant from the centre line to the bottom points, providing the two points at the top of each bay have the same relative position, and likewise the two bottom points.

It is best to mark these points where possible, on bolt heads or some other metal part, so as to prevent damage to the wood. It only remains now to cross-trammel each bay in turn, i.e., A C must be equal to B D. The cross bracings in the floor, as shown by the plan, are trued in a similar manner.

The tractor body is a much more complicated affair. Each portion—when it is built in two parts—is trued separately. The front part is trued in the way just described for the pusher, when its shape is rectangular. In the tail part a line is attached to a point at the bottom of the last strut, shown at A in Fig. 2. The distance from B to A is measured, and that distance is then marked off in the strut at the other end of the structure (shown C, D).

The top longitudinal, C B, is horizontal, while A E is at an angle to it in this case. The other end of the line is now made

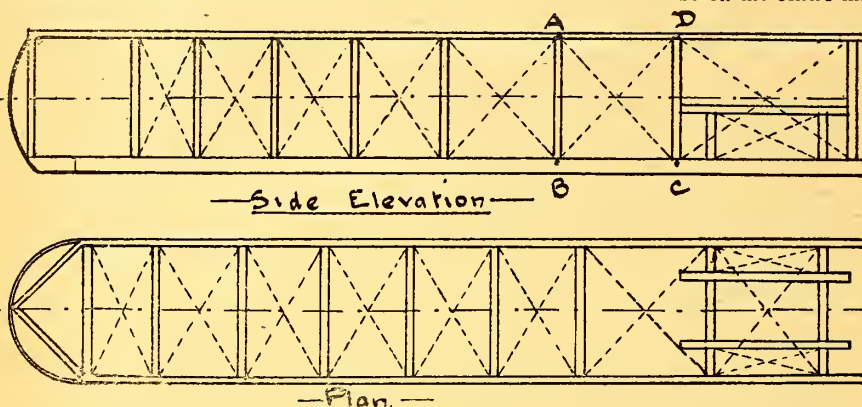


Fig. 1.

The first point to come under consideration is the truing of the body of the machine. In the "pusher" type of aeroplane the body is generally rectangular for the greater part of its length, while that of the "tractor" is longer and tapers off towards the tail. The "pusher" body is usually in one piece, and the "tractor" body is often built in two portions, one

attached to a point at the bottom of the last strut, shown at A in Fig. 2. The distance from B to A is measured, and that distance is then marked off in the strut at the other end of the structure (shown C, D).

The top longitudinal, C B, is horizontal, while A E is at an angle to it in this case. The other end of the line is now made

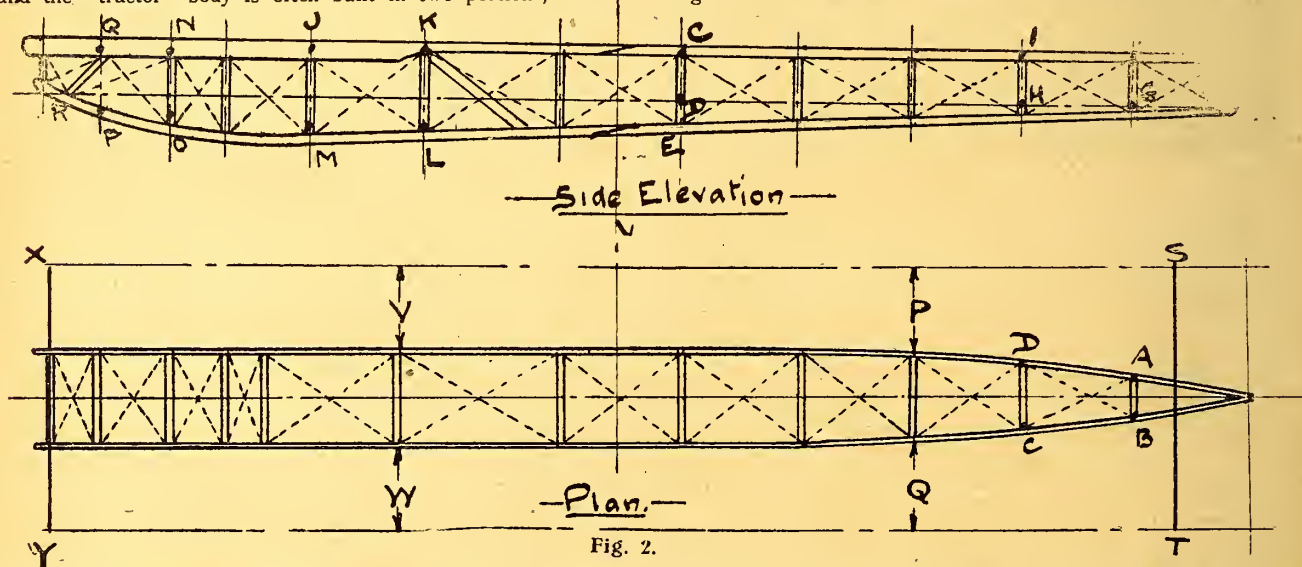


Fig. 2.

which contains the engine bearers and the pilot's and observer's seats, and the other which forms the tail. The adjustment of the "pusher" body does not present any difficulty.

Fig. 1 shows the skeleton of a body of the Maurice Farman type. It will be seen from the diagram that all the bays in the structure form rectangles, and it is obvious that, if the diagonals are equal, the rectangle being measured is true. The method of truing such a body is: first ensure that it is

fast at D. It can be seen that all points on the line A D are equidistant from the centre line of the top longitudinal.

Where the line crosses the centre line of the struts a very small hole is punched, and similar holes are made where the centre lines of the struts cut the centre lines of the top longitudinal. We have now a series of rectangles: A B F G, F G H I, etc. Each rectangle is taken in turn, and is trammed, and the bracing wires are adjusted till the

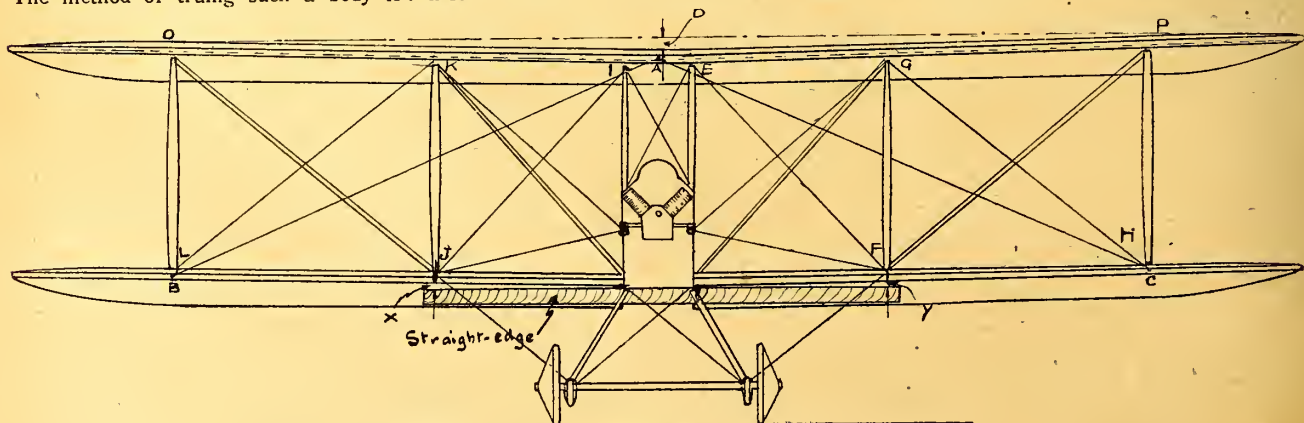


Fig. 3.



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Fig. 4.

diagonals of the rectangle are equal. Care must be taken that when one bracing wire is tightened, the other in the same bay is slackened off an equal amount, otherwise the struts will be bowed.

When it comes to the trammelling of the top and bottom bays, (shown in the plan) points are taken on each transverse strut, or on the longitudinals, e.g., A B C D. It is not necessary to have rectangles, because the longitudinals are at an equal angle to the centre line of the body, and the diagonals A C and B D will therefore be equal.

The figure made by the end view of the body is already rectangular, and the interval cross bracing is therefore easily checked when the necessary points for trammelling are marked off on the struts. In the front portion where the ends taper, as in Fig. 2, each bay must be marked as shown by J K L M, and then trammelled. Bay N O P Q presents a difficulty owing to the fact that it contains a diagonal strut, Q R. To get over this a plumb line is dropped from Q, and a point is marked on the bottom longitudinal at P; a corresponding point is now marked on the strut N O at O, and this gives the rectangle desired. When both portions of the body are secured together the centre lines of the two parts will form one line.

If a body such as the one in Fig. 2 is taken as an example, it will be true in an horizontal direction when the top longitudinalinals are in a straight line. The best way to do this would be to get one portion—say the front—horizontal, and then bring the tail portion level with it, checking it by means of a spirit level on a long wooden straight-edge—the straightedge would lie equally along the longitudinalinals of both portions. To check the body for alignment in a trans-

verse direction, attach two rods, S T and X Y, Fig. 2 plan, of equal length, at about the positions shown, the ends of the rods being equidistant from the centre line of the body.

Stretch lines to join S X and T Y, then any pair of measurements such as P Q and V W, if respectively equal, would prove that the whole structure was in line. Any faults in the alignment would have to be remedied at the points where the ends of the longitudinals were joined together.

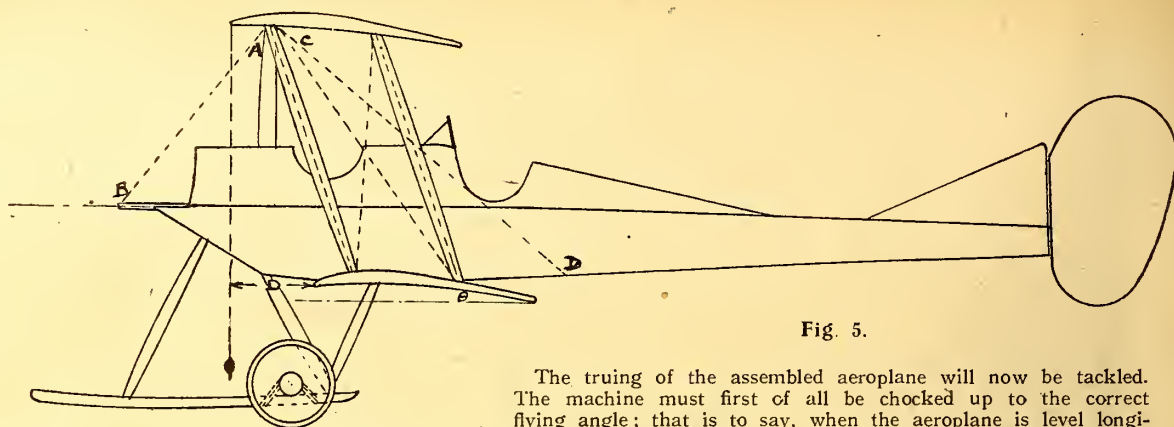


Fig. 5.

The truing of the assembled aeroplane will now be tackled. The machine must first of all be chocked up to the correct flying angle; that is to say, when the aeroplane is level longitudinally and transversely. This is checked by placing a spirit level along the engine bearers and raising or lowering the tail till the bubble is central, and then placing the level on a straight-edge across the bearers and chocking up the wheels till the transverse line of the aeroplane is level.

The next step is to brace the wings true with the body, so that corresponding points on each wing will be at equal heights

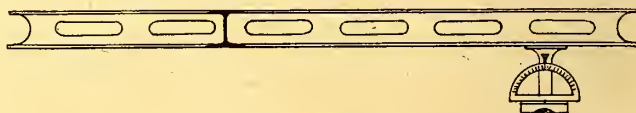


Fig. 6.

above the horizontal. To measure this a long wooden straight-edge is clamped under the body as shown in Fig. 3, and the space between the top of the straightedge and the leading edge of the planes is checked as shown at X and Y.

If these distances are unequal, the adjustment is made on the bracing wires marked E F G H I J and K L. All the wires must be strained equally, otherwise the wings will be bowed. A final check can be taken by measuring the distances A B and A C. A is a point on the top centre portion, and B and C are similar points on the wings.

In some types of aeroplanes there is what is known as a "dihedral" angle; that is, the angle made by the wings to the horizontal plane. The correctness of the angle given to the

and P, and then measuring the distance D. Fig. 3.

measuring the distance D, Fig. 3. The distance is equal to the sine of the angle made by the wings with the horizontal multiplied by the distance A P. Adjustments in this case would be made by wires E F, G H, I J, and K L. N.B.—Always start making alterations in the

This is particularly important in the case of the straining wires between the plates, because the interplate struts are very bowed. If a plumb line is dropped down the line of a strut, any bowing which has occurred will be quickly perceived.

The distance between the wings, or "gap," is generally shown on "General Arrangement" drawings, so a rough and ready method of checking this dimension on the assembled aeroplane is to cut a rod of wood to size and insert it between the wings. The best place to insert

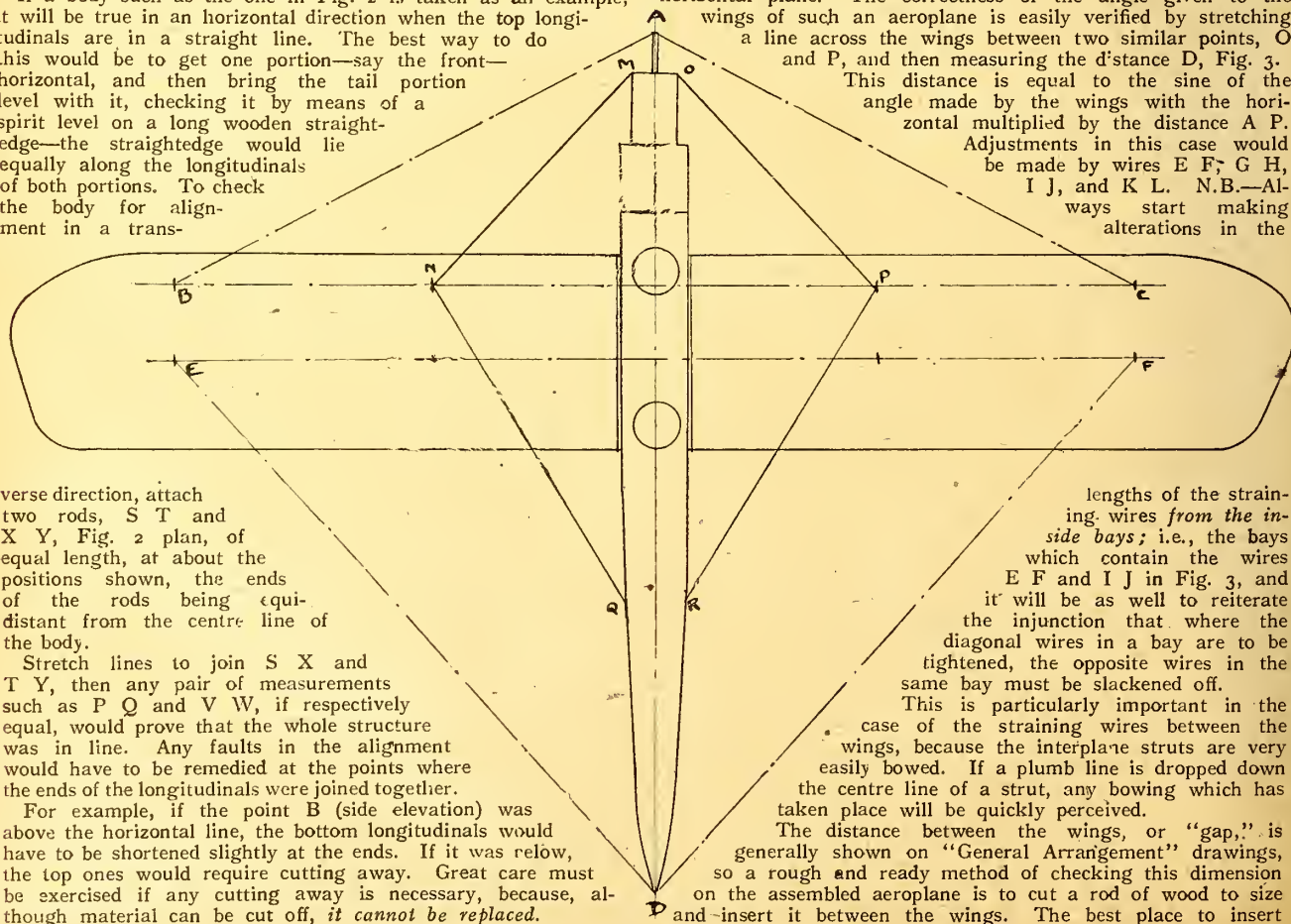
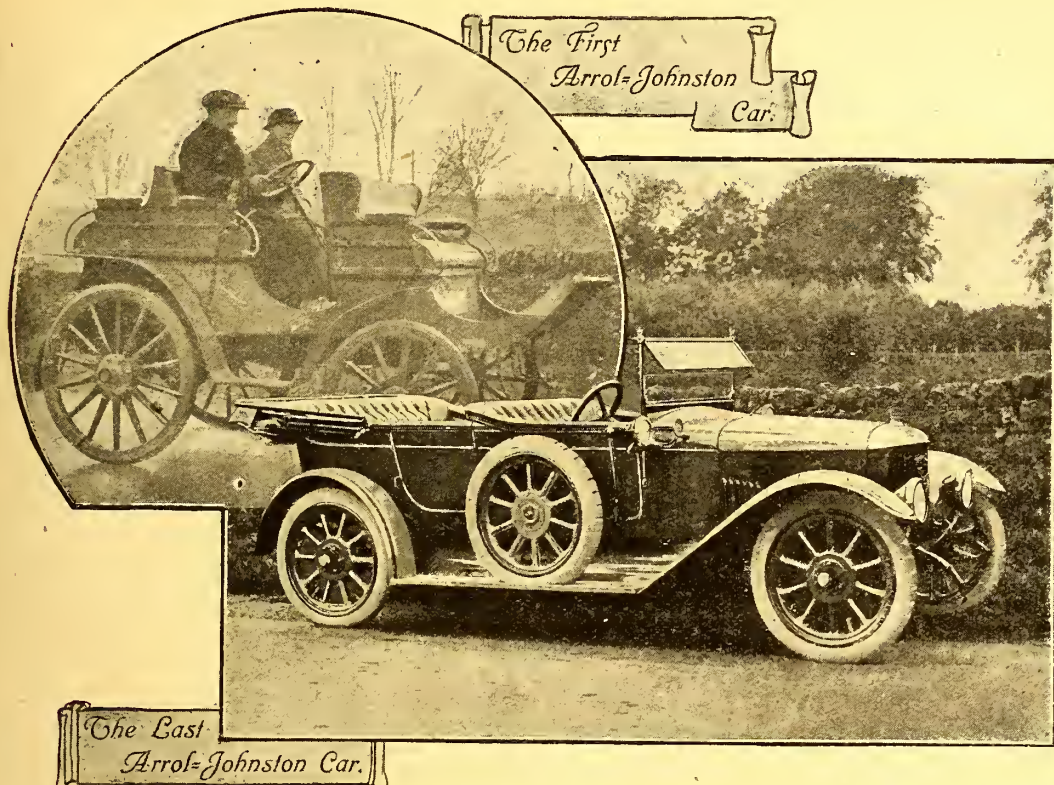


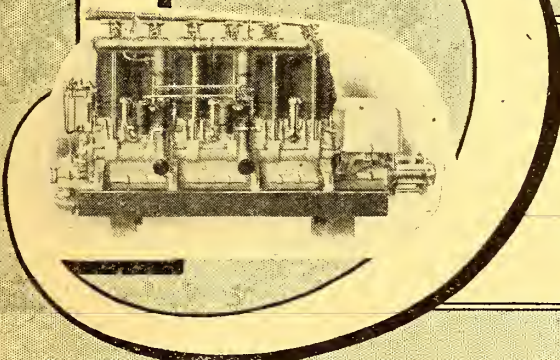
Fig. 7.



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it is near the struts, between the main longitudinal spars of the wings. These spars can be easily felt under the fabric.

Where it is possible, an instrument called a "gap stick" (Fig. 4) should be made. This consists of a length of steel tubing with a plug at one end and a sliding sleeve at the other. There are a set of graduations on the sleeve and another set on the tube.

The graduations on the tube mark distances between the ends A and B, when the centre mark on the sleeve is in line with the pointer P, which slides in a slot in the tube and which can be set to any of the graduations on the tube.

The marks on the sleeve are parts of an inch (32nds for preference), with a centre mark. The method of using the gap stick is as follows: The gap length is taken from the drawing and the pointer is set to correspond.

The stick is introduced between the wings and any difference in the length of the gap will be shown by the centre mark on the sleeve, which will be either above or below the pointer when both ends of the stick are touching the spars.

The only way to obtain the correct gap is to use great care in the fitting of the struts. They should be cut to dead lengths and then fitted square into the sockets; there should be no slackness anywhere, and the whole area of the ends of the struts should butt against the pads or the bottoms of the sockets. If this is not done it will mean endless trouble when the aeroplane is assembled.

In aeroplanes in which the wings are "staggered," the method of checking the stagger is to suspend a plumb-line from the top wing and then measure the distance between the string and the leading edge of the bottom plane; this measurement is shown in D, Fig. 5. Alterations to the stagger are made by wires A B and C D; the correct amount is always shown on the general arrangement.

AERO-MOTORS.

"Aero-Motors in Theory and Design" was the subject of last Thursday's Aeronautical Society's lecture at Cricklewood, the lecturer being Lieut. J. S. Irving, R.F.C.

The Chairman, Mr. Hugh Burroughes, in opening the lecture, stated that Lieut. Irving had been responsible for the testing of engines at the Royal Aircraft Factory for the last five or six years; these tests being carried out not only in respect of R.A.F. engines, but also of other makes.

The lecturer divided his observations into three sections:—(1) evolution; (2) modern aero engines; (3) future design.

The first really successful engine, he said, was that made by the Wright brothers in 1903, which was a four-cylinder vertical water-cooled engine, 112 mm. bore by 100 mm. stroke, and developed 30 h.p. at 1,300 r.p.m. for a weight of 7 lbs. per h.p.

Referring to the list of 51 modern engines which he had prepared, the lecturer gave the following summary:—

Type.	Number Air-cooled.	Number Water-cooled.	Per cent.
Vertical ...	...	10	19.5
Vee ...	6	19	49
Radial ...	2	5	14.0
Rotary ...	9	...	17.5
Total ...	17	34	100

Average M.E.P., 98 lbs. per sq. in.

Average weight per h.p., 3.7 lbs.

which summary illustrated the popularity of the Vee engine.

Mr. Irving explained that it was possible to construct the Vee type engine to give double the horse-power of a vertical for considerably less than double the weight.

To illustrate this, the lecturer gave a comparison between a 4-cylinder vertical type of engine giving 75 b.h.p., and an 8-cylinder Vee type engine giving 105 b.h.p., the weight of the former being 315 lbs. and that of the latter 420 lbs., i.e., only one-third heavier.

As an example of the general design of a high-powered Vee type engine he gave a well-illustrated description of a 220-h.p. Renault. He explained that he selected this engine for description as being typical of a modern Vee type engine, though its weight was excessive when compared with the Mercedes engine, from which it was copied, and other engines of Allied manufacture.

He next gave a comparative table of the different makes of 6-cylinder vertical type engines, which showed that on a weight per horse-power basis the lightest engine of German origin is 16 per cent. heavier than the lightest engine of English design, and later developments had considerably increased this difference.

The lecturer then turned his attention to the rotary type of engine and explained its advantages and disadvantages: the former of which, he said, might be summarised as follows:—

I.—Low weight per horse-power. II.—Flywheel effect of the rotating cylinders which gave a very steady running engine even when several cylinders were misfiring. III.—Absence of complication in the cooling arrangements.

Fig. 5 may also be used to illustrate the angle of incidence of the planes. This angle is shown on the drawing by O. In order to verify the correctness of the incidence given to the planes, an incidence gauge is used; see Fig. 6.

This gauge consists of a straightedge on one end of which is attached a protractor and a spirit level. The gauge is laid along the under surface of the plane, and the spirit level is moved until the bubble is central. The level, being attached to the protractor, is moved with the latter through the angle necessary to bring the bubble central; this angle is indicated by the pointer, and is equal to the incidence angle given to the wing. If the angle of the plane is incorrect, the adjustment is made by the diagonal wires shown between the struts in Fig. 5.

The fixed tail plane is easily levelled by placing a straight-edge along the top, and sighting from the straightedge to similar points on the main planes on either side of the body, or by trammelling from the bottom surface of the tail to points on the leading edge of the planes.

The tail plane, however, is fairly small and is rigidly fixed by means of plates or sockets to the tail, and therefore is not very difficult to true up.

In order to make sure that the whole aeroplane is lying true, fore and aft, take measurements from the extremity of the propeller shaft to points on the ends of the wings—see A B and A C, Fig. 7; and from the rudder post to other points on the ends of the wings as shown by the lines D E and D F. Each pair of measurements must be equal. If they are not, make the alterations necessary on wires M N, O P, Q N, and R P.

Throughout the operation of truing an aeroplane, no discrepancy is too small to be remedied. In practice errors of $\frac{1}{8}$ in. must be made good if possible, so ensuring that the planes, bracing wires, and every part of the machine is doing its proper amount of work.

Against which must be balanced the following disadvantages:—

I.—Low efficiency. II.—High petrol consumption. III.—High oil consumption. Approximately 75 per cent. of the oil usually supplied to the engine being wasted. IV.—Power required to burn the engine itself. V.—High head resistance. VI.—The difficulty in arranging a silencer system.

Although the fuel consumption had been reduced on the later type of rotary engine, particularly the Monosoupape Gnome, Le Rhône and Clerget, this type still compared unfavourably with the stationary engine.

With regard to radial engines, although these had been on the market since the early days of aviation, Mr. Irving did not consider that any really satisfactory engine of this type had yet been produced.

[Has he heard of the new Salmson, or of the pre-war 200-h.p. Salmson, or the 100-h.p. Anzani?—Ed.]

In treating with the third section of his paper, "Future design," Mr. Irving explained how the weight per horse-power went up with the increase in altitude owing to the decrease in efficiency of the engine at high altitudes.

These conditions would, he said, influence future design and the conditions obtaining at, at least, 10,000 ft. would be used as a basis on which to design engines. Two obvious alternatives presented themselves:—

I.—To use a large bore cylinder and restrict the possible output at sea level.

II.—To supply a constant weight of charge to the engine by some system of forced induction.

[Has Mr. Irving ever studied the forced induction which is part and parcel of any successful two-stroke design, such as, say, the Kelly-Saunders?—Ed.]

Mr. Irving was of opinion that the aero-engine of the future would be air-cooled, and stated that recent developments in air-cooled engine experiments had yielded some really surprising results. It had been found possible to increase the M.E.P. and at the same time considerably reduce the cylinder wall temperature and reduce the petrol consumption from 0.675 to 0.5 lbs. per b.h.p. hour.

An air-cooled engine with suitable cylinders, he said, was bound to eclipse any water-cooled engine of similar type owing to reduced weight of the complete cooling apparatus, approximately 0.4 lbs. per horse-power, and in conjunction with this saving in weight must be considered its greater simplicity; decreased vulnerability; increased reliability owing to absence of complication; greater adaptability for aero purposes and absence of danger of freezing at extreme altitudes.

Mr. Irving said he was quite prepared to see air-cooled engines of 500 to 1,000 b.h.p. used as a standard article before many years had elapsed.

[Would it not be wise for the authorities to avail themselves of Mr. Irving's apparently vast store of knowledge in assisting the production of one really useful engine of, say, 200-h.p.? It seems a pity that with so much information available the R.A.F.'s best attempt should still be a problematic 90-h.p.—Ed.]

Professor W. G. Duffield, D.Sc., is the lecturer for to-morrow Thursday, May 3rd, the subject being "Meteorology and Navigation."—H. H.

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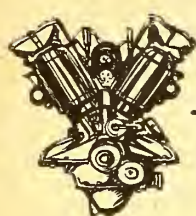


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AERO-MOTORS

IN KIND AND CONSTRUCTION

By Geoffrey de Holden-Stone



GODS OF TIN AND BRASS.

Good breeding, natural and innate to begin with, is really a matter of constant practice ever afterwards. That is why, for instance, one imagines that the best-bred individuals in all engineering are designers of two-stroke motors. They have to be. For none have so continually to pass the highest test of good breeding, listening patiently to those who know nothing about the subject you know most about.

Also—when driven to bay across a written report—having to contradict as definitely, yet as politely as possible, the manifest idiocies, inaccuracies, and negations of established daylight facts usually contained in such documents; especially those emanating from the ex-lumberers of the motor and tyre trades shoved into uniform for the period of the war.

Actually, it is the prevalence of these "experts" and their reports that is chiefly responsible for the duration of the war. [As, for instance, the tank scandal.—Ed.] So when it is won at long last by the men who have to win it—they always did—as best they can with third-rate material, and the Defence of Incompetence Act no longer runs, I shall have the greatest pleasure in publishing the signed facsimiles of about a score of these "reports," alongside plain records of results in each case.

They will, I am sure, be interesting to tax-payers, the war-bereaved, and the permanent bureaucracy. Especially the last. Unless we have, in the meantime, followed the recent Muscovite example, and hanged most of it to encourage the rest to suicide.

CONCERNING THE THREE-THROW CRANK-SHAFT

However, the two-stroke proposition is not without its natural gifts and compensations. One of these—when it is duly studied—proves to be the possibility—long sought in vain—of the successful use of the three-throw crank-shaft with its cranks set at 120 deg.; and its true—not bastard—duplication in six-cylinder modelling.

This particular ideal was, of course, the outcome of the sound mechanical training of steam-practice, bewrayed and betrayed by a misapprehension of the physical limitations of the four-stroke cycle. Its chief exponent years ago, was a certain well-known Coventry firm—an off-shoot of one still older that had engined half the Navy in its time—and then went astray in the company of even Panhards in France and Duryea in the United States.

What they had to discover painfully was this: that although for a single crank-shaft revolution the torque is excellent, there follows an immediate dwell with no effort occurring, before the next impulse arrives, which, even if the crank-shaft long survives—a none-too-likely result—is positively deadly to smooth transmission. And never did two wrongs fail more hopelessly to make one right than the coupling of two such triads into a six-cylinder model.

Yet, were this not the case, unfortunately, one can see that a six-cylinder V or Y type motor of this kind would make a delightful car-engine, compact to a degree. But as I say, the four-stroke cycle forbids; and would forbid, no matter how cunningly the ignition distribution was devised.

AND THE TWO-STROKE ADVANTAGE.

But—this is not necessarily the case in a two-stroke design; in which the impulse frequency is inherently the same as in a single acting steam-engine; and for each cylinder independently.

That, at least, is the physical aspect. Mechanically, of course, a three-throw 120 deg. crank-setting might not be at all appropriate to a given two-stroke design—since the working cycles of all of them differ very materially—but it is not necessarily debarred.

There need be no impulse dwell on cessation. In fact, designs are not only conceivable, but exist; and have been well tried-out, in which this setting happens to afford a certain favourable correlation of the individual pistons with regard to their function as valves.

Yet, simple as it appears to employ this peculiarity, with the assistance of piping and A.O. valves and double-ended pistons—all on a sheet of drawing paper, one risks mechanical failure in practice.

There are, however, methods of avoidance where there are risks. Fundamentally, the valveless ideal must be maintained; and to carry this out, there is only one method of treatment; namely, to recess the pistons, either to form D valves, or to serve as cross-conduits, or both. Needless to say also, the pistons must be of the differential type with a positive-delivery lower end in any case.

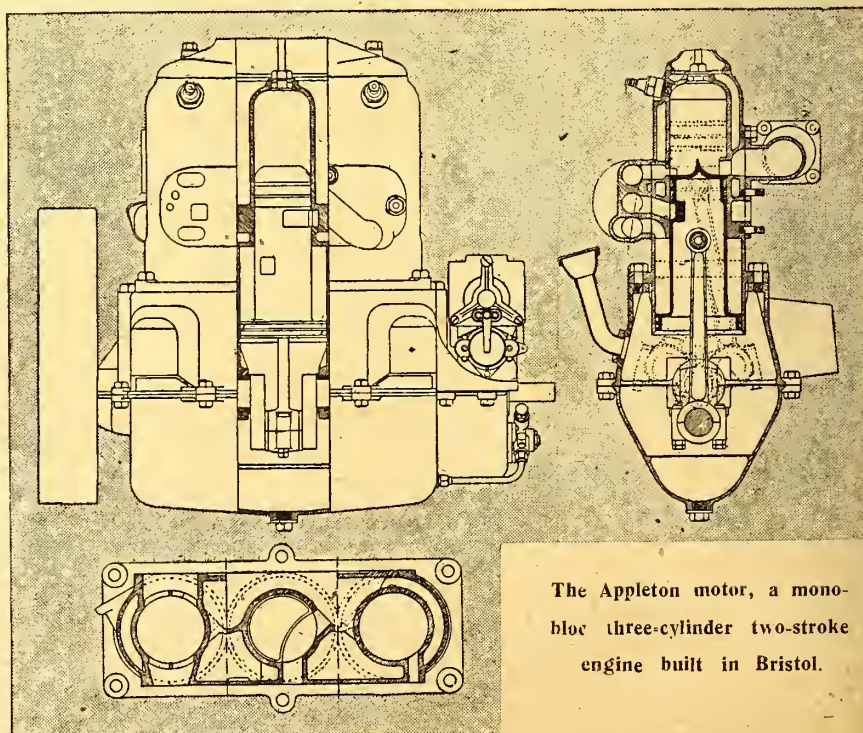
SOME PHYSICAL FUNDAMENTALS.

For here we notice certain grand differences between the four and two-stroke cycles. The former cannot depend on its piston suction—its sole medium—to fill its cylinders positively under all conditions of speed and load. All sorts of accidentals interfere to prevent this essential result, for true efficiency. The wire-drawing of throttle-control interferes. So does the overlapping of the successive phases, with their periods during which both valves are open. So does bad carburation; or again—though more remotely—ignition too much advanced or retarded. Likewise also—in an aero-motor especially—variation of altitude and atmospheric density. Any and all of a dozen things, in short, conspire against the continuous obtaining of a full charge.

This is also the case, I admit, in a two-stroker with the inlet opposite to, or below the exhaust: in the wrong relative position. As I have already shown, in this case, most of the new charge is driven over into the exhaust. Unless—the only way to avoid this result when the inlet and exhaust are in this relation—a D sectional or channel-like baffle is formed on the piston, extending all round the inlet ports, and freely perforated at the top of the D or channel: a method already patented, I may point out.

ANOTHER TWO-STROKE SCORE.

But otherwise, the advantage of the two-stroke cycle, with its simultaneous phase-incidence, the cylinders must fill, every time



The Appleton motor, a monobloc three-cylinder two-stroke engine built in Bristol.

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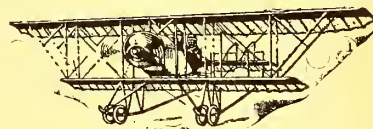
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especially with the positive, mechanically-force-feeding, delivery of the mixture from the pumping end of the differential piston.

Obviously, no variation of speed or load can affect that result. Nor can throttle control: for the initial vacuum created in the annular pumping-chamber at every outstroke, brings the *appel brutal* into play very strongly; so nothing resembling wire-drawing can occur. Heat is remote; and the effect of phase-overlap is different.

Admittedly, there are brief periods when both ports are open, as is the case with the valves in the four-stroke cycle. But whereas in the latter case the incoming of the new mixture succeeds the outgoing of the exhaust, both following *successive* induction and compression in the same part of the motor—in the case of the two-stroke cycle this incoming and outgoing not only “interlock,” so to say, with the secondary compression; but both *simultaneously* interlock with induction and transference compression phases, occurring elsewhere in the motor mass, and wholly unaffected by the first-named phases.

Such at length—albeit as briefly as may be—are the actual reasons why a properly designed two-stroke motor must, in all circumstances and conditions, get full charges constantly into its cylinders, subject, of course, to the degree of throttle-control. Also why it is really—as we can now perceive readily enough—about twice as efficient as a mere gas-pump, as any four-stroke motor can possibly be. And, incidentally, we have yet another explanation of the fact that accurate, economical carburation under all conditions is so much more readily achieved.

THE MECHANICAL PROPOSITION.

Yet though this is the physical ground of the matter, at any rate, the mechanical part of the problem of piston design is not by any means disposed of. One has not only to find the exact spot in the piston-trunk length for the recess, but to correlate recess area, bore and stroke, and the respective capacities of the working end of the cylinder, the pumping portion, and that of the transfer.

And as to this last, I may point out one thing, more or less usefully. If the transfer is to be purely a one-way conduit, there can be no harm in keeping its content small, for convenience sake; so as to keep the size and external bulk of it within small and neat proportions. Not only does it not matter if the mixture under transference is jammed into it at considerable pressure, but it is rather an advantage, first to ensure a bumping charge, and, secondly, to constitute a storage-chamber always replete with mixture, and free of any risk of loss through piston-ring leakage or slackness. All of which makes for easier starting.

But if the transfer is to be a two-way affair, used as a primary induction passage in the first place, prior to mixture-transference under force-fed pressure in the opposite direction, then this part must be fairly bulky: so that its internal content shall not represent more than 15 lbs. actual, or 30 lbs. absolute pressure. Otherwise, your pumping-chamber will not, and cannot, fill properly, either initially or subsequently: and the motor will not have its due efficiency as a mixture pump.

So it will be seen, on the whole, that four-stroke practice presents no such problems of combined calculation of physical efficiencies and considerations generally, with mechanical ingenuity.

THE APPLETON MOTOR.

Nevertheless, these problems, in connection with three-throw

crank-shaft and triad-cylinder construction, have been very successfully solved in the three-cylinder monobloc motor designed by W. M. Appleton, of Bristol, which I illustrate. In this model—which develops 35-h.p. at 1,100 r.p.m.—it will be seen in the first place, that the initial induction entry passage, with the carburettor is set on the exhaust side, a couple of inches or so below the exhaust manifold, and that, by means of the one-piece transfer manifold on the other side, the pumping chambers respectively supply the working ends of the next cylinders.

To carry this out, it will next be noticed that the pistons are recessed transversely—both the plan and elevation of the middle cylinder show this very clearly just beneath the rings of the upper part of the pistons. In each case, the recess coincides, when the piston is at full outstroke, with annular recesses or channels in the cylinder walls, so as to give free communication with an induction entry passage common to all three cylinders—a covered slot beneath the exhaust, practically—and the transfer manifold on the other side.

AND HOW IT WORKS.

Now this transfer casting is so ported in the first place, as to lead directly downwards—through corresponding ports in the cylinder casting—into all three annular pumping chambers. But obviously only one of these chambers can inspire mixture at a time, because the trunks of the other two pistons, rising or sinking, are cutting out. For the same reason when the differential end of any piston is compressing, the charge cannot get back to the induction entry.

But this transfer casting, we also notice, contains three diagonal passages, two of which run upwards and along from the pumping chambers, No. 2 and No. 3, to the inlet ports of cylinders No. 1 and No. 2 respectively, while the third passage runs upwards and along the other way from pumping chamber No. 1 to the inlet port of cylinder No. 3.

Nothing could be simpler. Thus each passage always contains a charge under increasing pressure, ready for its destined inlet port to open. The exhaust is well opened at the piston outstroke, but still, in my opinion, is situated just a little too near that point, and might well be an inch higher. Probably, however, the idea was to guard the inlet, and certainly that inlet is well guarded by a high deflector, centrally placed, so as not to baffle the incoming charge, but with a distinct cast-up in order to prevent loss through the exhaust.

Thus it may well be that very much less than usual is lost; and the best consequently made of an apparently inevitable, if not strictly correct, relative position of inlet and exhaust; one that with the circular D-sectioned channel previously suggested, instead of the baffle, would give an even better result and no risk whatever of loss through the exhaust.

Nevertheless, this Appleton two-stroke motor—which was thoroughly tried out, both on the road as well as on the test-bench, and ran up to 2,000 r.p.m. with a very much higher power increase than one might expect—should be well worth development for aviation, either as a six or even a twelve-cylinder V or Y type, both on account of the inherent compactness of its general design, and its particularly successful—indeed, unique—embodiment of the continuous torque of a three-throw crank-shaft.

(To be continued.)

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MARKET REPORTS.

Prices given are for quantities on the usual terms.

April 26th, 1917.

COPPER.—It is quite evident that the situation in America is influencing prices here, and it is more than probable that prices will decline to a lower level. There has been a further reduction in the price of Copper Sheets. It will also be observed that there has naturally been a reduction in the prices of Copper and Brass Tubing. A cursory glance at the following comparative prices of Copper Ingot will show that the tone of the market at present is fairly favourable.

Standard Copper.	To-day's price ...	£133
	A month ago ...	136
	12 months ago... ..	130
	Last year's average ...	116
Current Prices.	Copper Sheet ...	£168 p. ton.
	Copper Tube S.D. ...	20½d. per lb.
	Brass Sheet, 24 G. ...	16½d. „
	Brass Tube ...	17½d. „

STEEL.—Although the prices here are considered high, they are fairly normal compared with the abnormal prices now being charged for American steel.

The American prices are easily 300 per cent. above Sheffield prices, and there is no doubt whatever that the U.S.A. Steel Producers have been exploiting the Allies. There is a general feeling that now the U.S.A. policy has been clearly defined, the Government will see that prices are reduced to reasonable figures, and, in consequence, the business done with our new Allies will be considerably increased; it is also expected, as pointed out in the previous issue, that this will indirectly have a favourable effect on the output and prices of aircraft steels. At present prices remain the same.

Current Average Prices.

R.A.F. 3A Steel Rounds, 36s. per cwt. Basis.

R.A.F. 1E Steel Rounds, 28s. per cwt. Basis.

R.A.F. 9A, Sheet Steel, 30s. to 35s. per cwt.

ALUMINIUM.—The prices still remain the same.

Official Prices.	Ingot ...	£225
	Remelted ...	210
	Aluminium Sheet, 19G	2s. 10½d. per lb.

TIMBER.—The official control of timber is becoming more drastic than ever. An Army Council Order dated April 14th, 1917, has been issued with the object of limiting the purchase of all imported softwoods except for purposes of national importance. Timber importers and users are reminded that the regulations will be very strictly enforced, and false statements on the application certificates are punishable with a fine of £100, or six months' imprisonment. The three most important clauses are given below. Full particulars can be obtained from E. S.

Gale, Assistant Director of Timber Supplies, Caxton House, Tothill Street, Westminster, S.W.1.

(1) Save as herein provided, no timber merchant shall:—

(1) Sell in any month for consumption an amount of imported softwood exceeding 1 per cent. of the amount of timber which he had in stock in the United Kingdom on the 1st day of April, 1917.

(2) Sell for consumption any imported softwood unless:—

(a) He is satisfied that it is required for a purpose of national importance as defined in Form A set out in the schedule annexed.

(b) If the quantity sold to a single firm or individual amounts to one standard or more, he receives from the purchaser a certificate in Form A set out in the schedule.

(2) Any person wishing to purchase imported softwood for consumption whose needs cannot be met under Regulation 1 hereof may apply to the Director of Timber Supplies for a special permit. Such applications should be sent in duplicate in Form B, set out in the schedule hereto annexed.

If a permit is granted, a timber merchant is authorised to sell the amount stated therein in excess of the 1 per cent. authorised by Regulation 1 hereof.

(3) If such imported softwood is required for the execution of a Government contract or order, the applicant should attach to his application a certificate in Form C set out in the schedule hereto annexed, signed by a responsible officer of the Department concerned.

Aircraft firms likely to require softwoods of any description should apply at once for the necessary forms.

The position of the Silver Spruce Market is very serious indeed. The available stocks are becoming very depleted, and there are very few shipments arriving. Prices are still advancing, and there is every indication that they will continue to do so.

Walnut is very scarce. There are still good stocks of Mahogany available, but although prices are steady, it is more than probable that prices will advance.

Current Average Prices.

Silver Spruce, 14s. to 15s. c.f.

English Ash, 12s. to 13s. c.f.

Walnut, 2s. 5d. to 2s. 7d. s.f. Plank.

Mahogany, 2s. to 2s. 3d. s.f. Plank.

Prices are for selection and delivery.

FABRIC.—The official prices have not yet been issued, and seeing that the price for 19C will probably be 29/30d. per yd. 36 in. wide, buyers need not be anxious to place orders, as it is unlikely that the price could advance beyond this figure at present.

THE PATENTS INDEX.

The subjoined index of recent inventions has been specially compiled by THE AEROPLANE from the current Official Patent Records.

Boddam, E. M. T. Fittings for aircraft. No. 5614. April 21st.

Calderwood, D. B. Landing-tees for aerodromes, etc. No. 5618. April 21st.

Fortescue, A. J. Aerial machines. No. 5566. April 20th.

Kerr, J. J. Machine for the manufacture of propellers for aircraft, etc. No. 5605. April 21st.

Levy, L. G. Aeroplanes and hydro-aeroplanes. No. 5590. April 20th.

Liversedge, A. J. Aeroplanes. No. 5507. April 19th.

Moore, E. H. Alighting-gear for aeroplanes. No. 5443. April 18th.

Noble, E. E. Interrupter gear for aeroplane, etc., machine-gun. No. 5317. April 16th.

Reynolds, A. J. Stabilisers for aircraft. No. 5313. April 16th.

Ricardo, H. R. Driving-mechanism for propellers. No. 5553. April 20th.

Salmon, P. Internal-combustion engines for aircraft, etc. No. 5524. April 19th.

COMPLETE SPECIFICATIONS ACCEPTED, PRINTED COPIES OF WHICH ARE OBTAINABLE ON AND AFTER MAY 10TH, 1917.

105,460. June 14th, 1916. Warren, W. T. Connecting-plates for fuselage parts.

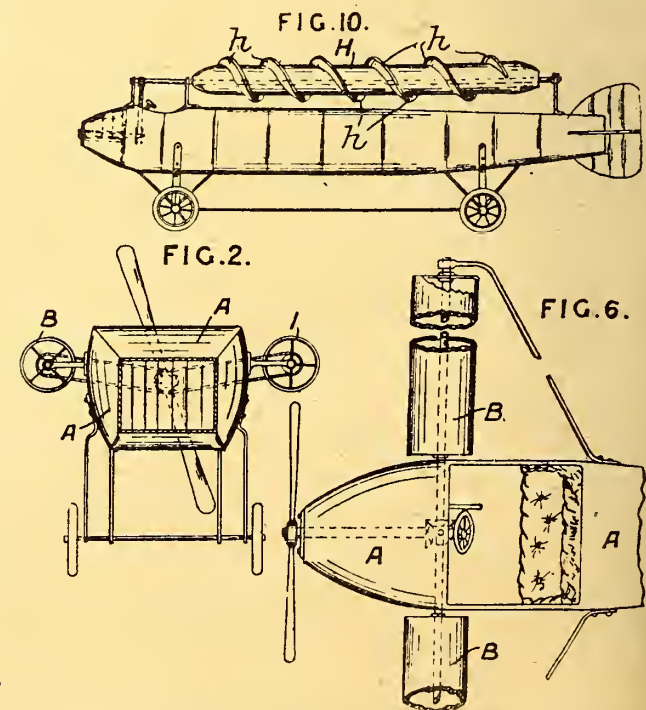
105,477. July 12th, 1916. Barnes, F. W. Forks for motor-cycles, aeroplanes, and the like.

102,262. Nov. 15th, 1915. Leo and Baradet. Internal-combustion engines.

RECENT ABRIDGMENTS OF PUBLISHED SPECIFICATIONS.

17,981. Propellers. SCOTTER, W. C., and SCOTTER, C. R.

Apparatus chiefly designed for lifting and sustaining aeroplanes comprises freely rotatable bodies of circular, elliptical, or polygonal cross-section arranged above or at the sides of the frame-



work. These propellers are driven by chain or bevel-gearing from the motor shaft. In the examples selected Fig. 2 shows two hollow cylinders B arranged parallel to the frame A, Fig. 6 shows similar cylinders arranged at right angles to the frame, and Fig. 10 shows a cylinder H fitted with a helix h.


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Boulton & Paul, Ltd., Rose Lane Works, Norwich

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol.

British Caudron Co., Ltd., Broadway, Cricklewood, N.

Canute Airplane Co., Royal Pier Gate, Southampton.

Central Aircraft Co., Palmerston Works, High Rd., Kilburn, N.W.

Curtiss Aeroplane Co., L. J. Seely, Clun House, Surrey St., Strand, W.C.

Davidson Aviation Co., Ltd., Hammersmith, W.

Eastbourne Aviation Co., Ltd., Eastbourne

Grahame-White Aviation Co., Ltd., London Aerodrome

Handley Page, Ltd., 110, Cricklewood Lane, N.W.

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National Aircraft Co., Ltd., 15, Hackney Rd. N.E.

Navarro Aircraft Co., Ltd., Burton-on-Trent

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2.

Norman-Thompson Flight Co., Ltd., Bognor

Roe, A. V., & Co., Ltd., Manchester

Sage, F., & Co., Ltd., Peterborough

Saunders, S. E., Ltd., East Cowes, I.O.W.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W.

Sopwith Aviation Co., Ltd., Kingston-on-Thames

Standard Aircraft Manufacturing Co., Effingham House, Arundel St., W.

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.

Warling & Gillow, Ltd., Hammersmith

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White, J. Samuel, & Co., Ltd., East Cowes

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Willans & Robinson, Ltd., Victoria Works, Rugby

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Hazel & Co., 4, Princes St., Hanover Sq., W.

Robinson & Cleaver, Ltd., Regent St., London, W.

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Central Aircraft Co., Palmerston Works, High Rd., Kilburn, N.W.

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland

The Swift Aeronautical Engineering Co., 41-43, Richmond Rd., Kingston-on-Thames.

Ward, Fredk., 6, 7, & 8, Allsop St., Upper Baker St., W.

Worms Aircraft Construction Co., Twickenham

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MacLennan, J., & Co., 30, Newgate St., E.C.1., and at Glasgow

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British Aeroplane Varnish Co., Ltd., Milburn House, Newcastle-on-Tyne, and 166, Piccadilly

British Cellulose Co., 8, Waterloo Place, S.W.

Celion, Ltd., Broad St., House, New Broad St

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Sturtevant Motors Co., 147, Queen Victoria St.

Sunbeam Motor Car Co., Ltd., Wolverhampton

The Gnome & Le Rhone Engine Co., Ltd., 47, Victoria St., S.W.

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Cowper-Coles Manufacturing Co., Sunbury-on-Thames

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Moss Gear Co., Ltd., Thomas St., Aston, Birmingham

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(Continued from page 1126.)

More particularly I like that very interesting suggestion made by my hon. and gallant friend as regards what is likely to happen when peace comes, and as to the Committee he proposes to set up. I think the Government are fortunate in their selection of a chairman.

It is quite possible that after within a month or a couple of months of peace coming, the Irish or the Paris mails may be carried by aeroplanes.

It seems to suggest that at last the administration of the Royal Flying Corps, the Royal Naval Air Service, and the Service generally is passing out of the hands of what might be called the elderly politician. It has always seemed to me such a pity that the administration of a Service such as this should not have been placed unreservedly in the hands of the generation that brought it into being. It is a new Service. It demands new interest. Young men should have their opportunities.

We have trusted very much to elderly advice, for in this country we always pay respect to grey hairs. Hence it has been rather difficult to convince some of them that possibly their views and their opinions were not quite in keeping with the ordinary lessons of the war in front of which we find ourselves.

"The lamp of their youth will be utterly out,
But they shall subsist on the smell of it,
And whatever they do they will fold their hands,
And suck their gums and think well of it;
Yes, they shall be perfectly pleased with their work,
And that is the perfectest hell of it."

Mr. Tennant (formerly Secretary of State for War): I listened rather with some astonishment to the hon. Member for Herts (Mr. Billing) when he spoke of the absence of a policy, and he said that ever since the beginning of this war he could not see that in any of the conduct of operations there had been a policy at all. I venture to think that he is wholly mistaken. If the House reflects on what the Royal Flying Corps has done, how it has contributed in the operations in the field by photographs, by its wireless telegraphy, and in artillery observation, I am sure the hon. Member will agree with me that that has been a policy which has been not only of inestimable value, but absolutely of the greatest possible necessity to the operations. And not only in observation for artillery, but in observation of every kind, in reconnaissances throughout the whole of this war, the Air Service has really been the eyes of the Army. That is a commonplace.

[That is not a matter of air policy, my good man. Such things pertain to the use of aeroplanes as military accessories, and in no wise affect the policy which would direct an Air Fleet if it existed.]

I have often thought that my hon. friend the Member for Brentford deserved our greatest consideration and our entire sympathy for the astonishing productions which come in his post-bag. I am very sympathetic with him for being the recipient of so many disheartening missives.

[A cheap sneer, entirely worthy of Mr. Tennant.]

Captain Burgoyne (referring to the empty benches): I do not know whether hon. Members have such intense faith in the Air Board that they do not wish to hear these matters discussed, or whether it is that this being a great national question it does not appeal to them as much as some of those questions of much less importance. I have too much personal vanity to think that the absence of hon. Members is due to the fact that it has been my good fortune to catch your eye, Mr. Speaker.

The newest of our Services has for too long been the Cinderella of our Government Departments, and those of us who have taken an interest in the matter have not only rather begun to despair, but, at the same time, they have been a little suspicious as to what was going on behind the scenes.

I am bound to admit, after listening to the hon. and gallant Member's description of the function of the Board and the work it is throwing on to its various members, that I am afraid it is getting a little too complex. I do not wish to follow the Chairman of the Parliamentary Air Committee on those lines at all, but I want to deal with the Royal Aircraft Factory. That factory has got a very bad name in this House, and I do not think it has altogether been deserved. I regard the Royal Aircraft Factory as the cradle of the Royal Flying Corps.

[Which accounts for the stunted growth of the R.F.C. child before the war, and its weakness in material strength when its growth was forced beyond its years. Whereafter, for some inscrutable reason, Captain Burgoyne delivered himself of a long history of the R.A.F., according to the R.A.F. view.]

Captain Burgoyne continued: We heard all sorts of rumours committees were appointed, inquiries took place, and in the result the Royal Aircraft Factory got a name which was certainly not very sweet. What did we get as the result of all these inquiries? We got a series of statements defining the exact position that the Royal Aircraft Factory ought to hold in future.

The Committee on the Administration of the Royal Flying Corps, in their Report of last year said:—

"We think that the continued existence of the Royal Aircraft Factory is essential."

Everybody agrees with that. It is our first aerial dockyard.

"It should not, in our opinion, become a manufacturing establishment, but should confine itself to the five subjects stated in the Report, namely: (1) Trial and experiment; (2) research; (3) preparation of drawings; (4) repairs; (5) manufacture of spares."

It is perfectly well known that the factory is much more a manufacturing factory than it is devoted to research work. I purpose to read letters and other documents to prove that is so. My argument becomes a little difficult in that I have found the Parliamentary Secretary to the Air Board out in a complete contradiction of statements in his opening remarks. He first said of the Royal Aircraft Factory, "It is being dealt with on precisely the same terms as any other manufacturing firm." He subsequently told us that they were doing exactly as much research work as before. He cannot run with the hare and hunt with the hounds. Neither of these statements can be absolutely right.

What has been the attitude of the Air Board in regard to the Royal Aircraft Factory? They start by moving—I dare say for very good cause—Colonel O'Gorman from that particular sphere to another sphere, where, no doubt, he is doing valuable service, and we get Mr. Fowler put in charge. I have never had the privilege of meeting him, but I am quite sure that Mr. Fowler is a man of very eminent capabilities, but obviously, however eminent and whatever his business capacity, he has got to spend some time getting a grip of that huge business employing nearly 5,000 people. How much further did they go in getting rid of their expert staff? Lieut.-Col. Hextall Smith has gone; Major Green has gone after seven years' service; Captain Hiscox has left after nine years' service; Captain Winnington has been removed from the Electrical Research Department, after two years' service; and Mr. Heron has left after valuable service on experimental work. Capt. Grinstead, chief officer of Physical Research, after four years' experience, shanges his function to that of chief designer.

It may be passing through the minds of one or two hon. Members, "Ah, but they were not found fit for their jobs." Every single one of these gentlemen has gone to a very high billet in a private firm. If the hon. and gallant gentleman is going to tell me, "Ah, but what we have done is to send our people out as scouts in advance so that we get a hold on these private businesses," then we can talk matters over on a different basis; but if he is not going to say that, and obviously no one is going to make such a suggestion, when it would get back to the whole trade, why in the world did he allow the very best men to leave the Royal Aircraft Factory, the only air dockyard that we have got to-day?

[A curious suggestion. Who could have thought of that?]

But even the Air Board have felt a little unhappy as to what they were doing in the matter of policy with regard to the Royal Aircraft Factory. Annually a programme has got to be prepared for the purposes of the annual estimates, and on this occasion the programme for the Royal Aircraft Factory ran into many scores of aeroplanes. I want to emphasise their discomfort by mentioning the fact that as adjudicators in all these matters they wrote to the General Officer responsible for these orders over the signature "H. P. Harvey," who, I believe, is secretary of the Air Board, as follows:—

"The proposed course has the disadvantage of involving a rather large order to the Royal Aircraft Factory, which is contradictory to the assurances which have been given in Parliament."

I shall be glad to show the hon. and gallant gentleman the letter. It was sent to the General Officer from whom you get the programme of the factory for the next year, and it was written on Sept. 28th last year. This General Officer, in whom the entire Service, as also the Air Board, has the utmost confidence, sent an absolutely admirable answer that he was trying to do the very best for the Air Service.

This placed my hon. and gallant friend on the horns of a dilemma, and he has been bound to reverse the policy laid down in this House and by various Committees which have sat upon the Royal Aircraft Factory. The concurrence of the Air Board in the reversal of their policy down there had not been obtained—anyway, up to the end of January this year.

I now come to a very serious criticism indeed. I do not object in the slightest to the Royal Aircraft Factory building aeroplanes. It is essential that they should do their best to keep our designs right up to the mark, but what is wrong is that they should start the construction of designs which have been sworn to be better than anything turned out by private firms, and subsequently, after great expenditure of public money, find that the series has been deleted.

I would ask the attention of the Parliamentary Secretary to this: I am certainly not going to give any names or the numbers of machines, but the types which are to be tested in next year's programme are six, of which it is said:—

"As the provision of a machines is very much ahead of machines in use now passed, probably these types will, if they are well handled, be serviceable for the whole of next year."

Of one of them it is stated—this is interesting:—

"The design should be completed by Jan. 30th, 1917, and the first machine flying by March 14th. It is considered that this aeroplane might be safely manufactured at the Royal Aircraft Factory to the number of 30 before the first machines are flown."

[The old, old story. Order R.A.F. designs in quantities untested, and hang up all output till they are revised and re-altered and made to fly somehow.]

Mr. Montagu: Will the hon. and gallant gentleman be good enough to tell us exactly what it is he is reading from? Is it the published Report of the Air Board?

Captain Burgoyne: No.

Mr. Montagu: Is it correspondence between the Air Board and a private firm, or between the Air Board and the Royal Aircraft Factory?

Captain Burgoyne: These are letters that have been sent to me. They are not letters which are going to involve anyone or give information to the enemy. If the hon. and gallant gentleman thinks they are going to give information to the enemy, of course I will close down at once.

Major Baird: I am quite sure the hon. and gallant gentleman would never read anything which would give any information to the enemy, but I must say that I am very much surprised at hearing letters read out which, to the best of my belief, are official letters addressed by the Secretary of the Air Board to another public body. I do not know and do not wish to inquire how the hon. and gallant gentleman obtained them, but they are undoubtedly official documents. I would also point out that they are all from the old Air Board. The conditions now are absolutely different. I would point out that nothing is to be gained by advertising to a communication between a body which has ceased to exist, in the shape of the old Air Board, and the Royal Aircraft Factory, which in those days was under the direction of the Director of Aeronautical Equipment.

Captain Burgoyne: I quite agree with what has been said so I will go straight off that and come to another side of the matter. I wanted to say something about engines. There, again, although this letter is a public one, it is interesting.

Major Baird: That again came under the old Air Board. It was by a pure fluke that I happen to have been connected with the old Air Board and the present one. There is really no continuity in any way between the two.

Mr. Montagu: If the hon. and gallant gentleman (Captain Burgoyne) wishes to discuss in public correspondence conducted by Government Departments, let us by all means unite together to press the Government to publish it, but it is rather a strange and anomalous proceeding that one member of the Committee should quote communications which the House as a whole has not seen.

Captain Burgoyne: Both my hon. friends have been very kind about the matter, and their action is quite sufficient to make me turn immediately to another subject. This comes under the aegis of the Parliamentary Secretary, and the facts must be known to tens of thousands. Last week there was a certain number of strikes among wood workers in the aeroplane factories. Where the Air Board comes in and the hon. gentleman might answer is as to what power they have to support the owners or managers of these factories when such strikes take place.

It would be interesting to know whether the National Physical Laboratory at Teddington is in the hon. and gallant gentleman's Department.

Major Baird: If the hon. and gallant gentleman wants an answer, I will tell him it is not in my Department, but is in the Prime Minister's Department, although we are in constant communication with it.

Captain Burgoyne: May I put my case first? The National Physical Laboratory was founded to investigate scientific problems and to help all those interested in aeronautics. Obviously, if it was founded for that purpose, manufacturers and men whose integrity is above reproach have the right to go and obtain the result of those investigations. At the present time how do they stand? They have, first, to get a permit as to whether or not they can have that knowledge. When they go down with that one specific question, they can get an answer back; but if there is another question which seems to arise out of that answer, they cannot put it because they are told they must get another permit.

In one instance it took three months to obtain the information required, and in that time the particular series of machines dealt with in the question was deleted.

It would be advantageous to the whole of aeronautics if any man well known to the authorities, and who was above reproach and desired information, could go down there, hand in his card, and say that he wanted to know this or that. That is what the National Physical Laboratory was founded for.

One does see a glimmer of hope in the opening remarks of the hon. and gallant gentleman. So long as we see progress being made that is consonant with the development of this new industry, I do not think he will find any hostile critics in this House.

Mr. Butcher: As a member of the Air Committee over which Mr. Justice Bailhache presided, I wish to express the hope that

the new Board may carry out effectually the anticipations we have formed of its efficiency and success. We sat in that Committee for twenty-two days and examined fifty-four witnesses. We then formed the opinion which was summarised by Sir David Henderson the other day, when he said:—"The flying men of this country are the salt of the earth, and they deserve the very best engines and machines that can be supplied to them."

[The pity is that so many are unnecessarily salting the earth to-day.]

May I say a word about the recommendations of the Committee of which Mr. Justice Bailhache is the Chairman? Our first recommendation was that the equipment of the Royal Flying Corps should be entirely separated from the executive command. That has been done, and I believe everyone approves that it is a proper and useful change. Our second recommendation was that there should be one equipment department, charged with the equipment both of the Army and Naval Air Services. I am glad to say that the Air Board is the embodiment of that recommendation, and I think there is every reason to hope and believe that some, if not all, of the friction and difficulty which existed in the old days, when the Royal Flying Corps and the Royal Naval Air Service were looking about the world separately for aeroplanes and for engines, will have disappeared, and that the result may be that both Services may be better and more efficiently supplied than they were in former times.

[There is, however, the danger that Supply Coalition, like Government Coalition, may act deleteriously by destroying competition.]

As to the second recommendation on which my hon. and gallant friend (Capt. Burgoyne) has enlarged, namely, that the Royal Aircraft Factory should not become a manufacturing establishment, but should confine its activities to the subjects with which they dealt formerly. I think it would be far better if they assisted the Air Board and the technical advisers of the Air Board in experiments in design, as to designs of aeroplanes and engines, and let the private firms of the country to a greater extent do the manufacturing.

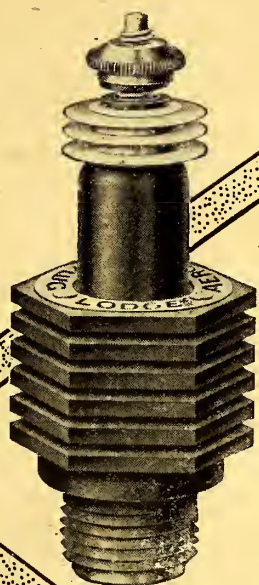
[Always provided the private firms are permitted to produce better designs, and are not lumbered up with orders for R.A.F. machines which are inferior in performance to their own designs.]

I believe that at the present time the Germans have a very fast fighting machine with very powerful engines, and with very considerable power of climb and speed. I should like to be assured that sufficient care is being taken to see that we have the most powerful and effective engines possible. The German engine is, I understand, the Mercedes. I am rather inclined to believe that we have not any engines of the Mercedes type. I do not quite know why, because I presume the design of the Mercedes is just as familiar to us as it is to the Germans. I know we have some very good engines of high power, and I would only suggest to my hon. and gallant friend, what no doubt is very present to the minds of his advisers, that if we want to obtain that undisputed superiority which is essential to us, we must do the very utmost we can to get the highest-powered engines. I have heard the phrase, "Building an aeroplane round an engine." I believe it is not an inapt phrase. The engine is of far more importance than the aeroplane, and if you have a first-rate engine, thoroughly reliable, of very high power, I should think it quite possible that it is the view of experts that you can build an aeroplane round it which will do justice to the engine.

There was one point connected with the recommendations of this (Air) Committee to which I want to refer. One of the members, Mr. Charles Bright, took immense pains, not only to think out and digest the evidence given, but I think he also read every part of the literature of engines and aeroplanes which exists in this country. He made some very valuable separate recommendations, and I was very glad to hear from my hon. and gallant friend, in a reply to a question the other day, that some of these recommendations had already been adopted and put into operation. I think he also said that it was probable that some other of these recommendations would be adopted, and I shall be glad to hear from him, when he replies, whether further progress has been made in that direction.

Mr. Shirley Bann: There are one or two points in my hon. and gallant friend's speech about which I should like to say a word or two. I urge on him not to lose sight of the fact that you can get greater dispatch in building standardised aeroplanes than in building an ordinary motor. In the second place, he said we have aeroplanes at the front which were not up to the mark, that he was sorry and hoped to send better. When he is sending better can he not bring home the trained pilots out at the front, who are flying on the lower-engined machine, to help train the new men and to practise on the higher-engined aeroplanes here before sending them out to the front to fight?

The third point is: Can he not, now that America has come into the fight, arrange in America to get a large number of aeroplanes built and sent over here and use them as scouts to look after the submarines which are lying off our coasts and in the Mediterranean and to act with our merchant ships, because if we had a large number of these aeroplanes over here they would



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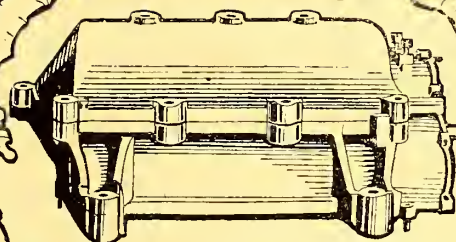
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form a great protection for our merchant ships, which are being sunk ruthlessly.

[A very sound suggestion, seeing that the flying-boat came originally from America.]

Major Baird: The criticisms which have been offered may be summarised fairly easily. In the first place, there is the usual criticism of the B.E. machines. That is, so far as anything can be in aeronautics, a hardy annual, and I am sorry not to be able to give any satisfaction, I am afraid, to hon. members who quite definitely ask that that machine should be withdrawn from the front. It is impossible to withdraw it until it can be replaced by another.

[It could and should have been replaced over a year ago.]

It is ruthless and brutal—anything you like—but it is war. We are supplying proper machines as rapidly as we can, but until we can supply them there is not the slightest chance that we can discontinue to send the other machines up on these duties.

[Agreed, absolutely, but why waste labour and material in making more of them, as is being done to-day?]—

Mr. Joynson-Hicks: I do not wish to press my hon. and gallant friend, but can he give any approximate date when he thinks there will be enough new machines to prevent these machines going on bombing expeditions?

Major Baird: Aeronautics is a most desperate thing to prophesy about. Let me give my hon. friend an example of the kind of difficulty that absolutely queers the pitch. One of the new machines which we are sending out has a very satisfactory engine, but an appalling quantity of them have proved to be faulty when we came to test them in all their parts. It was due to faulty casting, faulty mixture, and faulty treatment. I only mention this as showing the extraordinary difficulty of prophesying. That puts the manufacture of these engines back.

Mr. Billing: Was the design faulty before they made the new castings, or was it purely and simply in the mixing of the metal that the mistake occurred?

Major Baird: It was not the design at all. Then I come to the R.E.8 I was taken up in the R.E.8 last summer, when it came out and went to the front. It was reported on very favourably, and the machine began to come out in quantities. It is produced in deference to requirements which are received from the front. There are no drawings, and it is made more or less by hand. When the R.E.8 went out it met with universal approval. Men who are flying the R.E. at the front are clamouring for this machine. Officers who are flying from headquarters to the brigade at the front all beg to be given this machine in preference to other machines, and yet you have most regrettable and horrible accidents happening with young pilots.

I am sure the hon. Member for Herts has been misinformed when he said that young pilots were sent up after such a short time in the air. The minimum number of hours is twenty-six.

Mr. Billing: Does that twenty-six hours include the initial training to obtain a pilot's certificate, or the twenty-six hours' cross-country flying, or the twenty-six hours' training in the air?

Major Baird: Twenty-six hours' soaring in the air. That is not all. Do not let hon. Members imagine that when a pilot gets out to France he is sent over the lines until he is considered by the officers out there to be fit. Of course, an occasion may arise when a man arrives from England in the afternoon, and he is sent up bombing at night.

No one realises the value of the pilot's life more than those who depend for the success of their operations on the work of the pilot, and no one is less likely to squander the pilots—it is a horrible expression to use, but I hope hon. Members know what I mean—and no one is less likely to make a pilot unfitted for work where the risk is disproportionate to the result which may be expected than the officer in command of the pilots at the front.

The R.E.8 machine has given satisfaction. Of course, there had to be modifications. I do not say it is perfect. It would be ridiculous to deny that a machine on which there have been numerous accidents requires modification.

I deprecate very much the idea that it would be to our advantage in any way that an attempt should be made to take the conduct of operations out of the hands of trained naval and military officers.

The Air Board is in no sense a manufacturing body. The whole of the supply and manufacture is in the hands of the Ministry of Munitions. But we who are concerned with the air all live in one house. We begin the day by a meeting of the officials representing the heads of all the departments, who meet in one room and compare notes, and arrange any differences which exist. This has been found to be a convenient arrangement, and in that manner any danger of friction, if there had been any—as far as I know there has been none whatever—is eliminated, and we expedite enormously all the work that has to be done; for instance, such things as exchange of machines with the Army, when exchange is possible—for, as a rule, there are not enough for both—are arranged under this system of beginning work with a meeting of representatives of the heads of all the departments.

Mr. Shirley Benn: Can the hon. gentleman say anything about getting seaplanes from America?

Major Baird: That is not being overlooked, but as my hon. friend will realise they have to take their turn with other things. It is not so much a matter of production as a matter of other claims that have to be considered.

Mr. Billing: I do not think this Debate ought to be allowed to close without calling attention to the fact that there have not been forty Members present during the whole of the time the hon. and gallant gentleman has been replying to the various points that have been raised. I see that there are not more than nine Members present at this moment, and that has been the maximum number during the whole of the hon. gentleman's observations.

He made the remark that the present conditions of the Air Service might be likened to the Western front on the outbreak of war, when the bandsmen and the cooks had to go into the fighting line; but I would like to point out to the hon. Member representing the Air Board that the officers who were responsible for ordering the machines should have taken steps to see that they ordered them of the right type.

The hon. gentleman also suggested that we cannot have standardised machines for reproduction for some time, yet we have a machine which has been in use for two years, and which has been a standardised type—a most inefficient type—for that period; and he now suggests that we cannot standardise a much more efficient type for the next six months.

Reference has been made to the R.E.8 machine. It is a machine which has a lot of tricks in the air, and requires to be handled by a most skilful pilot. Design is at the bottom of the matter, and it is because those in command have supported men who have produced machines of bad design that half our troubles exist to-day.

In all my criticism with regard to this Service I have been prompted by a desire to save the lives of pilots, and to offer suggestions which I thought might have some grain of constructive merit. It may have been that I have been looked upon as offering those suggestions in a bundle of chaff, but I trust that hon. Members will recognise that I made them with good intention.

I would suggest to the hon. and gallant Member that there is a position for someone in this country which requires filling up. The position might be filled possibly by the Chairman of the Air Board, who, although he is an amateur, may be a strategist. We have discovered in this War some very good strategists amongst amateurs. That position to which I refer is the command of what would be a raiding squadron as distinct from the Royal Naval Air Service. That is the point I have been trying to impress on this House until I wonder which of us is the more weary.

I know there is considerable objection against such an appointment. I know that the Royal Naval Air Service would object to it, and probably the Navy would object to it, and I know the Army does not wish it either. Surely, if the requirements of the Army are met by the Royal Flying Corps and those of the Navy by the Royal Naval Air Service, there is no reason against the formation of a raiding squadron.

This Debate has been listened to by very few Members. I thank the Parliamentary Secretary for sticking it out. If he will take kindly to our constructive criticism, then I am sure we will endeavour to treat him to that rather than destructive criticism. If we feel that all our suggestions are tabooed, then there is no encouragement to continue in that kind of criticism. I should like to congratulate the hon. and learned gentleman (Mr. Butcher), who sits here and who formed one of the late Air Inquiry. It is the first time since I became a Member that I really felt that some useful purpose was being achieved by the critics of air administration here when I heard him admit that the various recommendations which the Committee had put forward had not only been approved, but adopted, and that there had been some wonderful reforms on account of that Inquiry. I felt that surely we Members who fought for that Inquiry as hard as we could had not laboured in vain. I should like to thank my hon. and learned friend for the gracious tribute he paid to the critics in pointing out the enormous good brought about by the Committee of Inquiry which the critics of the Air Service in this House brought into being.

Mr. Lynch: I would say by way of apology I was the first Member in this House to advocate a great air fleet, a great air policy, a separate Ministry, and separate arm. That is so long ago that it seems now in the limbo of time, although it took place in the early stages of this War. But again and again, when I have come into contact with those great Departments of State on whose activities the very life of the nation depends, I have been astonished even in the estimate I would like to form of Englishmen, of their lack of brains and lack of real intellectual capacity, and the invariable habit of trying to shoulder off responsibility. My hon. friend who has just sat down (Mr. Billing) has been attacked again and again, he has been sneered at in this House, and he has been treated most unfairly. I do not hold a brief for him, because he is very well able to defend himself, but I will say this, that it is greatly due to the driving force which he has brought into these Debates and to the suggestions which he has made, that we have had that degree of activity which produced the Air Board.

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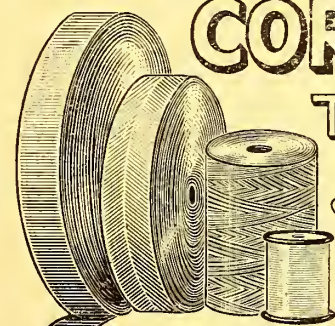
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QUOTATIONS WITH SAMPLES BY RETURN.

THE AMERICAN AIR SERVICES.—II.

BY "BERKELEY."

It is when the compilers of the Staff Study under discussion treat of the functions of aircraft that their statements become more consistently open to question. There is little agreement amongst the critics, military or civil, when the details of aircraft employment are formulated. Each has his own view as to the desirable height for sustained flight on active service, and each cherishes fondly his own vision of useful speed.

There is a ready gauge of the essential in these matters, and that is the performance of the enemy. It cannot be tabulated, for, like all that is vivid, it is constantly changing as efficiency and knowledge increase. But it is well with a flying service if its aeroplanes possess a rate of ascent and a speed of flight in excess, unit for unit, of those of its antagonist.

The American Study states that at heights above 4,000 feet an aeroplane is safe from rifle fire. There are some with experience who would prefer this figure to be 6,000 feet, and their view is nearer accuracy. It is further stated that anti-aircraft guns have increased this height of partial safety to 6,000 feet, at which height there is alleged to be reasonable security.

Here, again, experience teaches that this again is a grave underestimate, and that 8,000 feet even does not give security. When it is known that direct hits have been made at 12,000 feet, one realises that a 20 per cent. reduction of that height brings aircraft to a danger zone of unpleasant activity. But this question of a safe height is an evasion of warlike practice. The correct height to fly in war is that at which the work in hand may most efficiently be executed, and it varies according to the urgency of the duty.

On occasion it may be necessary to fly at as low a height as 1,500 feet, and to undergo the highest degree of risk in order that possibly the duty may be carried out. The successful issue of the attempt may influence vitally the progress of operations, and will justify the necessary expenditure of life and material in its execution. No service aviator possessing a normal degree of military sense will ever fly at a lower height than is necessary for the ordained duty.

The improvement in methods of observation and in knowledge of the appearance of the terrain from above, as well as the higher efficiency of the newer cameras, make it in general possible to fly at a greater height than was common in the earlier days of the war.

AN OBVIOUS MISAPPREHENSION.

As an instance of almost complete misapprehension of the practice of the war, it is perhaps well to quote paragraph 11 in full:

"Strategical Reconnaissance.—Reconnaissance of this kind is strategical in its nature. The tactical reconnaissance of particular localities is still carried out by troops and captive balloons. In fact, it may be said that all strategical reconnaissance is now carried out by aircraft. The reconnaissance is carried out by an officer who requires considerable experience in order to be able to distinguish objects on the earth and assign to them their true military value. The pilot is either an officer or non-commissioned officer. The observer is always a trained tactical officer, because in reconnaissance of this nature an untrained person cannot interpret the military significance of what he sees."

There is little question that the major part of all strategical reconnaissance falls to the lot of the aeroplane, owing to its particular and peculiar powers, but to state categorically that aircraft take no part in tactical reconnaissance is to deny that arm of the service one of its primary and most important duties. No

battle is opened in the present war without prolonged and detailed tactical reconnaissance by aircraft.

The entire sector over which the combat is to take place is examined in close detail by aerial scouts, and thousands of photographs are taken, which form the basis of the map in accordance with which operation orders are drafted. It is true that in open warfare the duty of tactical reconnaissance is carried out, or in theory should be, by cavalry and aircraft in conjunction. But nothing can displace the importance of the aeroplane in these matters.

Whatever may be the strict meaning of the term "tactical officer," it is not clear why tactical knowledge should be of high and particular value in "strategical" reconnaissance. The underlying truth is that officers employed on aerial reconnaissance should not only be highly trained but should have had several years' Army service, in order that their military knowledge should possess the virtue of habit and that recognition of military dispositions should be instinctive and not as a result of deliberate thought.

It has not been possible, under the conditions of rapid expansion of establishments consequent on previous lack of political insight, to employ a very high percentage of officers of the old Army as observers, owing to their services being required more urgently in other places. But the temporarily altered conditions cannot affect the underlying principle that the observer is the most important unit of aircraft personnel, and that he should be deliberately selected for his military knowledge and personal intelligence.

PHOTOGRAPHY.

The importance of photography is briefly indicated, but it does not appear to be realised by the compilers of the Study that aerial photographs are supplementary to the ordnance maps where such exist, and that by means of the latter the distortion of the photographs can be eliminated and the scale adjusted. Over terrain which has not been surveyed, special methods can be adopted of reducing the photographically compiled maps to scale, and with special simplicity if a portion of the ground is in friendly occupation. But these systems, though probably commonly practised by both antagonists, are not yet a proper subject for public discussion.

The references to the employment of aircraft as spotting agents for the artillery are in accordance with common knowledge. There is a tendency to underestimate the powers of the artillery officer, acquired as a result of exhaustive and efficient training. The aeroplane assists, but does not supersede, the regular artillery observation.

AERIAL SUPREMACY.

Several paragraphs are devoted to the "control of the air," a synonym for the "aerial supremacy" beloved of the daily news-sheets. The value of aerial superiority is illustrated by instances from the present war. The domination gained by the aerial services of the Central Powers in May, 1915, over the Russian forces is briefly described.

It is not always realised that the aerial services of a country must be in numerical relation to the size of the nation's forces on land and sea. Neither at present nor in the immediate future is it to be expected that an aerial offensive can be waged against an enemy unless there is the necessary army or navy to consolidate the advantage gained. The flying services are still a section of the army or of the navy. The time has not

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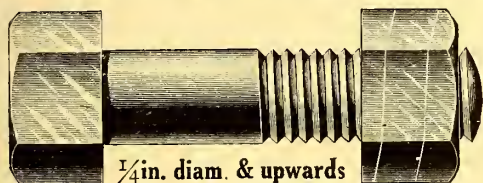
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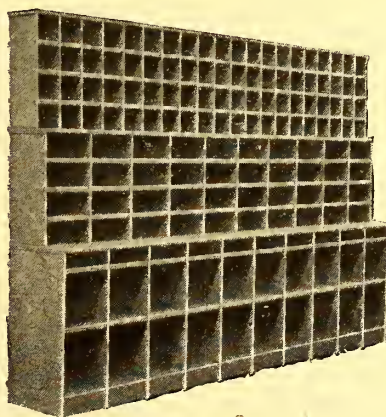
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come, nor is it in sight, when the army will be a necessary adjunct of the forces of the air.

There is no reason to assume that the air services, either of the Allies or of the Central Powers, have as yet reached their proper relative strength in comparison with the forces of which they are a part. Therefore an individual campaign is being waged by each air service against its rival, and earthly troubles fade away.

While it does not appear possible to attain a definite "aerial supremacy," it is desirable to achieve such a measure of power in the air as will permit of one's own aeroplanes carrying out as valuable work as can those of the enemy. A contest on an equal footing is vastly removed from a position in which the enemy is able to carry on reconnaissance over larger areas than are available for our own aircraft. The courage of the personnel should be supported by the efficiency of the machines supplied for their use.

SURPRISE.

The prevailing misunderstanding as to the meaning, in the military sense, of the word "surprise" is again shown by the compilers. They say that the element of surprise is greatly reduced in modern warfare by the use of aircraft. Undoubtedly, if the word is used in the customary sense, their contention is correct. Surprise, however, in military terms, implies strategical and tactical dispositions which, while possibly visible to the enemy scouts, cannot be readily countered by the enemy in the time available. Napoleon's strategy in the operations leading up to the Battle of Rivoli is an instance of this manner of "surprise."

The use of aircraft in bomb-dropping operations is outlined, with due regard to the inexactitude of the present practice of the art. The weights of aircraft bombs in common use are curiously underestimated, the largest being given as fifty pounds.

The following extract illustrates the American military realisation of the difficulties attending the art of bomb-dropping: "The factors of height, speed, and wind are almost impossible to compensate for entirely up to the present time, so that consequently bomb-dropping in general, or the launching of projectiles of all kinds from aeroplanes, has not attained great results in so far as the actual destruction of material or personnel is concerned. Advances along this line are constantly being made, however; but progress is slow. A special type of aeroplane has been developed for drop-

ping bombs and battle purposes. For bomb attacks on any locality, these machines are sent in flotillas of from 30 to 60 machines, each of which is provided with from 5 to 10 bombs. They go to the locality and circle over it, dropping their projectiles. Against railways, roads, bridges, and hostile parks of various kinds, this method of attack has given considerable success."

PERSONNEL.

In the paragraphs devoted to the organisation of aeroplane units, the compilers say that "Flying personnel has to be developed in the military service. . . there are few in the civil population who can be drawn on." So far from this being an accurate description of the conditions prevailing in the French and British services, the exact reverse has been the case during the present war. The majority of the pilots and mechanics have been obtained by direct entry, and the civilian schools of aviation have given preliminary training in flying to a very high percentage of these pilots.

Some observers, as in the case of pilots, have been seconded from the Regular Forces, but the greater number have come from the New Armies and the Territorial Force. It is curious to read in this American study that the observers were usually "trained staff officers." The limitations to the supply of staff officers in all European armies is evidently not appreciated in the regions beyond the Atlantic!

BALLOONS.

Balloons, dirigible and captive, are dealt with at some length, but nothing either new or illuminating is given. The date of the study, or an example of the obtuseness of its compilers, is indicated by the sentence following a reference to the Zeppelin raids over this country: "Aeroplanes appear to be unable to cope with them at night."

The study, when treated as an article specially written for the pages of a public print, possesses value, but as a considered thesis by officers of a General Staff it lacks illumination and charm. Those who may have the opportunity of reading the full text of the study would find it interesting to compare the style and the theories expounded therein with certain articles on aviation which appeared in the "Army Review" during 1912 and 1913. These latter articles, written by young officers of the Regular Army, and based on theory in the absence of practice, were models of their kind, and to-day in the light of experience are not seriously at fault.

AN ERRONEOUS NOTION.

An eminently respectable paper, pertaining to the carriage industry, and named "Cooper's Vehicle Journal," has recently sent a letter to an aircraft construction firm, inviting subscriptions to the journal in the following terms:—

"Dear Sir,—The Aircraft Industry is and will be passing through a similar phase to which the motor industry came through some eighteen to twenty years ago. Undoubtedly the impetus which war has brought about has opened up a future which nothing short of war could have done. It is quite correct to attach the aircraft industry to the motor industry, and as many of our subscribers will eventually make it their own, we have thought it our duty to embrace its interests in the programme of 'Cooper's Vehicle Journal.' We would say that our motor interests will not suffer in the least. We shall attach experts in aircraft construction and design to 'Cooper's Vehicle Journal,' and eventually prove ourselves as serviceable to manufacturers interested in aircraft as we have in the past proved our value to the motor builders. We would like to be allowed to add your name to the list of subscribers to 'Cooper's Vehicle Journal,' in view of our work on

aircraft. May we be allowed to do so?—Thanking you in anticipation, yours faithfully, for 'Cooper's Vehicle Journal,' Ltd.,

(Signed) Per pro Y. E. Worrall, Director."

Possibly this letter has been sent to other aircraft constructors, and so it deserves a certain amount of comment.

The letter suggests that Mr. Y. E. Worrall has acquired an entirely erroneous notion of the Aircraft industry in that he says that "It is quite correct to attach the Aircraft Industry to the Motor Industry." This is quite a mistaken idea, and indicates considerable confusion of thought.

Prior to the war, the aircraft constructors—that is to say, the great pioneers of the Industry who helped to save the country in spite of itself—were not in any way part of the motor industry. They were not in favour with motor merchants, nor did the Society of Motor Manufacturers and Traders do anything notable to aid the welfare of aircraft constructors.

Nearly all the firms which made aeroplanes were exclusively devoted to aircraft construction. The one or two who had other interests outside aircraft—e.g., Vickers and Armstrongs—really go to prove that the

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Aircraft Industry was not part of the motor industry, for in so far as those firms were also interested in motor-cars their motor departments were merely a side-line.

Since the war, some motor-car firms have undoubtedly taken up aircraft construction, but so have other firms who were not motor-car constructors—e.g., William Denny & Bros., S. E. Saunders, Frederick Sage & Co., Parnell's, Petter's, and a host more—far more numerous, in fact, than the motor firms who have taken up aeroplane making as a stop-gap.

It is quite a mistake to regard the Aircraft Industry as part of any other industry—least of all the Motor Trade. It is an entirely separate and independent industry, and one may depend upon it that it will continue so.

The reason some people regard the Aircraft Industry as a branch of the Motor Trade appears to be that aircraft, like motor-cars, are a means of transit. So are railways and ships, and so are horse-drawn vehicles, perambulators, bicycles, and roller-skates.

It is true that many people in the Aircraft Industry have been at one time or another in the Motor Trade, and some were even in the Cycle Trade before that, but it would be better to regard them as being like the "wise men who came out of the East," of whom a modern philosopher has remarked that they were obviously wise men because they "came out" of the East.

Not only is the Aircraft Industry a separate industry, but it is going to be one of the greatest industries the world has ever seen, for it is the only industry except Shipbuilding in which the finished product ranges in size all the way from that of an ocean liner to that of a motor-bicycle. And it has an advantage over the Shipbuilding Industry in that, whereas ships and boats are limited to use on water, aircraft cover the whole world, land and water alike.

Therefore the Motor Trade, in so far as it is concerned with making internal-combustion aero-engines, may be considered an ancillary trade to the Aircraft Industry, as may the cabinet-making trade and sundry others. Even then it seems likely that the making of aircraft engines will be in the hands of firms who are not concerned with making motor-cars, or only so concerned in another department, as in the case of the Sunbeam and Arrol-Johnston companies. Which would be more desirable, because it would free the aero-engine from the conventionalism of the car engine. Already several of our best engines—e.g., the Gnôme, Le Rhône, Salmson, Green, and Clergêt—are built by firms who have nothing to do with road motors, so that the separation from the Motor Trade, *qua* automobile makers, is complete.

Thus one sees how absurd it is to state, as does Mr. Worrall, that "it is quite correct to attach the Aircraft Industry to the Motor Industry."

A ROYAL VISIT.

The King and Queen motored from Windsor on April 27th to the Martinsyde Works at Woking, Surrey. Their Majesties passed through all the departments. During the visit a number of aeroplanes circled overhead, and Mr. F. P. Raynham, on a new type of Martinsyde, performed a number of manoeuvres.

THE AERONAUTICAL SOCIETY OF GREAT BRITAIN.

MR. HOLT THOMAS' LECTURE ON "COMMERCIAL AERONAUTICS."

The appointment of a Committee, with Lord Northcliffe as Chairman, to study the question of post-war aviation, as announced in the speech by Major Baird, in the House of Commons last week, makes it proper to draw particular attention to the fact that Mr. Holt Thomas is to lecture on May 30th before the Aeronautical Society on "Commercial Aeronautics."

Lord Cowdray, President of the Air Board, has kindly consented to take the chair. The lecture deals very fully with all the questions likely to affect the future of aircraft as a commercial proposition, works out costs of freight and fares to various

parts of the globe, and is illustrated by a considerable number of films, prepared at very great expense, illustrating the carriage of goods and passengers both inland and over-seas, the delivery and collection of mails and numerous other interesting details.

In all of these matters actual experiments have been carried out by Mr. Holt Thomas, and the lecture should be of supreme interest at the present juncture, for none is better qualified than Mr. Holt Thomas to deal with the subject, seeing that his aeronautical ventures form, undoubtedly, the biggest commercial undertaking of their kind in the world.

Tickets of admission can be obtained by application to the offices of the Aeronautical Society at 7, Albemarle Street, W.1.

Those interested are urged to apply at an early date, for the attendance is bound to be very large, and one is fairly sure that it will be necessary for the Society to arrange for the use of a larger hall than that at the Society of Arts.

IN THE HANDS OF THE ENEMY.

According to the "Daily Express" the "Norddeutsche Allgemeine Zeitung" of April 18th gave the following list of British aviators and machines which are declared to have fallen in the German lines on the Western front during March:—

- 14 Sopwiths—two-seaters:—
- Nos. A 1108 and 4818: Lt. W. Reid, Lt. H. J. Green.
- No. 4594: Occupants dead.
- No. A 1111: P. H. Lowndes, name of other occupant not known.
- No. A 4168: Pilot dead, observer severely wounded.
- No. 1907: Occupants taken prisoners.
- One aeroplane, number unknown, as it was entirely burnt, with its occupants.
- No. 5748: Occupants wounded and prisoners.
- One aeroplane with "le Rhone" motor, 2637: Occupants dead.
- No. 7763: Lt. Charles Stuart Vane Tempest, Lt. Allinson.
- One machine, the number of which was not decipherable: Lt. Duff, Capt. Stuart.
- One-seaters:—
- No. A 633: Capt. (?), severely wounded.
- No. 6170: Occupant dead.
- No. 6165: Occupant dead.
- No. 6633: Name of occupant not known.
- 10 Vickers—two-seaters:—
- [Any "pusher" fighter is called a "Vickers" on the Continent, so some of these may be F.E. or de H., single seaters, or they might be Vickers B.E.s.—Ed., THE AEROPLANE.]
- No. 1953: Capt. William S. R. Blomfield, Sec. Lt. Victor O. Landsdale.
- No. A 5443: Occupants taken prisoners.
- One aeroplane, number not known: One occupant dead, other severely wounded.
- No. 1948: Lt. F. E. Hills, Lt. A. S. Ryall.
- No. A 5439: Occupants dead.
- One machine, number not recognisable: One occupant, Lt. Knight, name of the other not known.
- One seater:—
- No. 7941: Capt. H. C. Southon.
- No. 7882: Lt. J. M. Montebault.
- No. 3425: A.M.C.: Occupant burned.
- No. 4874: Sec. Lt. G. J. Hasde.
- Six B.E.:—
- No. 12205: Occupants burned.
- No. 5856: Lt. A. G. Watts, Lt. G. Underwood.
- No. 5179: N.C.O. Cooper, Lt. Appleton.
- No. 6232: Lt. Byrne, Lt. Smith.
- No. A 27: Lt. Wildon Anderson, Lt. Duncan Boyd Wolley.
- No. 2560: Occupant taken prisoner.
- Six F.E.—two-seaters:—
- No. 4803: Occupants taken prisoners.
- No. 464: Lt. Charles A. R. Schum, Lt. E. C. Coops.
- Two two-seaters, numbers unknown.
- One-seaters:—
- No. 6397: Sec. Lt. W. B. Hill.
- No. 6456: Lt. Shepard.
- Two Nieuport one-seaters:—
- No. A 279: Lt. Whiteherd.
- No. 6615: Lt. Hugh Welch.
- Spad:—No. A 6633: Lt. Parves.
- Hispano Spad:—No. 6607: Lt. Baker.
- One Martinsyde:—No. 7508: Sec. Lt. Webster.
- One machine, two-seater, type (?), rotary motor: R. 36068 Capt. Lees, Bir., rank unknown.
- The following English machines have fallen into German hands on the east and south-east fronts:—
- One Nieuport two-seater:—No. 3182: Lt. Sidney George Beare, Lt. Edgar Peary Hyde.
- One Sopwith two-seater:—No. 5223: Two English naval officers, both dead.

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The Assistant Director of Aircraft Equipment has offered to the Chelmsford Town Council a machine-gun and part of the girder of a Zeppelin for a collection of local war relics. Similar collections are being arranged in other towns.

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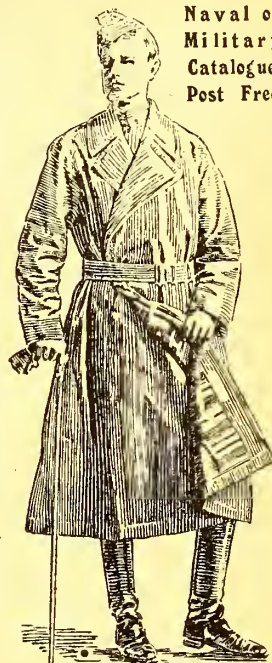
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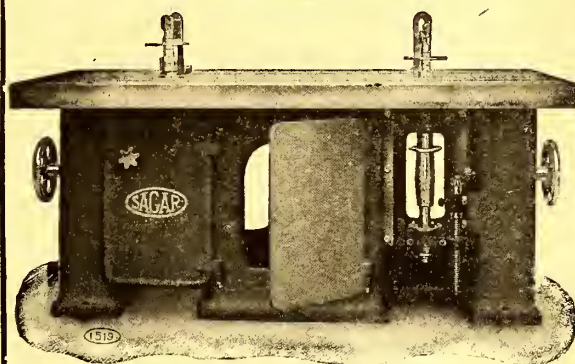
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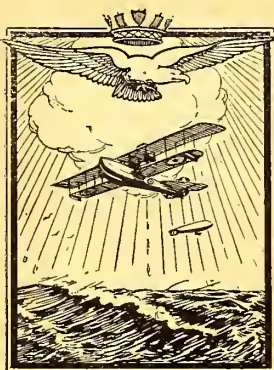


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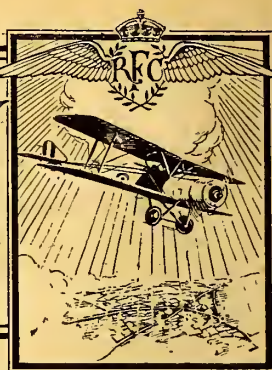
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FROM THE "LONDON GAZETTE."

WAR OFFICE, April 25th.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Group Comdr.—Maj. (temp. Lt.-Col.) T. C. R. Higgins, R. Lanc. R., from a Wing Comdr., and to be temp. Col. whilst so empld., March 6th, 1917. Sqdn. Comdr.—Lt. (temp. Capt.) O. D. Filley, M.C., Spec. Res., from a Flt. Comdr., and to be temp. Maj. whilst so empld., April 10th, 1917.

TERRITORIAL FORCE.—R.F.C.—Maj. Henry Fowler, R.E., T.F., to be Lt.-Col. (temp.), April 7th, 1917.

* * *

WAR OFFICE, April 26th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Sqdn. Comdr.—Capt. P. R. Grace, Spec. Res., from a Flt. Comdr., and to be temp. Maj. whilst so empld., April 8th, 1917.

Flt. Comdrs. from Flying Officers, and to be temp. Cpts. whilst so empld. April 8th, 1917: Lt. W. A. Bishop, Canadian Gen. List; Lt. P. E. M. le Gallais. R. Suss. R. April 12th, 1917: Temp. Sec. Lt. (temp. Lt.) H. G. Bowen, Gen. List; Lt. S. H. Pratt, R. Fus., Spec. Res.; Sec. Lt. H. J. N. Drope, Spec. Res. Adjut.—Lt. (temp. Capt.) W. A. A. Chauncey, York R., vice Maj. M. Freeman, Worc. R., Spec. Res., Feb. 28th, 1917.

Park Comdr.—Temp. Capt. A. S. Morris, Gen. List, from an Equipment Officer, 1st Cl., and to be temp. Maj. whilst so empld., April 1st, 1917.

Equipment Officer, 1st Cl.—Sec. Lt. (temp. Lt.) E. W. Havers, Spec. Res., from the 2nd Cl., and to be temp. Capt. whilst so empld., April 1st, 1917.

* * *

APRIL 26th, 1917.

The King has been pleased to confer the Military Cross on the following officers in recognition of their gallantry and devotion to duty in the field:—

Sec. Lt. (temp. Capt.) Christopher Joseph Quintin Brand, R.F.C., Spec. Res.

Whilst on patrol with one other machine he attacked a formation of five hostile machines and shot one of them down in flames. On another occasion he brought down two hostile machines. He has at all times shown great courage and initiative.

Lt. James Rattray Burns, Sco. Rif. and R.F.C.

When co-operating with artillery, he attacked a hostile machine, and by skilful manœuvring forced it down out of control.

Sec. Lt. (temp. Lt.) William Samuel Caster, Cyclist Bn. and R.F.C.

He led a successful long-distance raid and brought six machines safely back in very bad weather. On another occasion, while leading a long-distance bomb raid, he engaged five hostile machines.

Temp. Sec. Lt. George Courtenay Dell-Clarke, Gen. List and R.F.C.

When his machine was set on fire, although himself severely burnt, he landed and extinguished the flames in his machine. Later, although his machine was in a dangerous condition, he flew back to his aerodrome and handed in his reconnaissance report.

Temp. Lt. Leonard Dodson, Gen. List and R.F.C.

He has continually shown great courage and determination in photographing the enemy's positions under the most trying conditions, and has brought down three enemy machines.

Sec. Lt. (temp. Lt.) Harold Forrester Duncan, High. L.I. and R.F.C.

During an aerial combat, although twice wounded, he continued firing until his gun was hit and put out of action. He then kept in communication with his pilot during the remainder of the action, and continually informed him as to the whereabouts of hostile aircraft.

Sec. Lt. (temp. Lt.) Charles Edward Murray Pickthorn, A.S.C., Spec. Res. and R.F.C.

For conspicuous gallantry and devotion to duty in attacking hostile aircraft, and in carrying out difficult reconnaissances. On one occasion, although wounded, he continued his combat and brought down a hostile machine. On two other occasions he brought down hostile machines in flames.

AUSTRALIAN IMPERIAL FORCE.

Capt. Allan Murray Jones, F.C.

When carrying out a raid on a hostile aerodrome he descended to a height of 200 feet under very heavy fire and destroyed two hangars. On another occasion he flew for a total of nine hours and 20 minutes in search of two officers who were lost.

* * *

The King has been pleased to approve of the award of the Distinguished Conduct Medal to the following non-commissioned officer for acts of gallantry and devotion to duty in the field:—

6391 Cpl. (Actg. Sgt.) F. Johnson, R.F.C.

* * *

The King has been graciously pleased to award the Military Medal for bravery in the field to the following men:—

9272 2nd Cl. Air Mech. J. H. Beaven, R.F.C.

7770 1st Cl. Air Mech. F. T. Fowler, R.F.C.

50863 Sec. Cl. Air Mech. A. E. Rudd, R.F.C.

* * *

ADMIRALTY, 25th.

Warrant Officer (2nd Grade) to be Flt. Lt.—T. O'Connor, April 24th.

WAR OFFICE, April 27th.

REGULAR FORCES.—STAFF.—The following temp. appts. are made at the War Office:—

Staff Cpts.—Sec. Lt. E. S. Halford, R.F.C., Spec. Res., from an Equip. Officer, 3rd Cl., and to be temp. Capt. whilst so empld., April 11th.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—The following appts. are made:—

Sqdn. Comdrs.—Temp. Capt. K. R. van der Spuy, M.C., Gen. List, from a Flt. Comdr., and to be temp. Maj. whilst so empld., April 13th. The appt. of temp. Maj. P. G. Ross-Hume, Gen. List, notified in "Gazette" of Feb. 24th, is antedated to Sept. 25th, 1916, but not to carry pay or allowances prior to Feb. 9th.

Flt. Comdrs.—From Flying Officers, and to be temp. Cpts. whilst so empld.:—Sec. Lt. G. Mackrell, Spec. Res., April 2nd. Sec. Lt. J. H. T. Letts, Linc. R., April 5th. Temp. Sec. Lt. E. J. Garland, Gen. List, April 7th. Lt. R. A. Logan, Spec. Res., April 8th. Sec. Lt. C. Sutton, Spec. Res., April 10th. From Flying Officers:—Capt. E. B. Grenfell, D. of Corn. L.I., T.F.; Sec. Lt. (temp. Lt.) H. M. Probyn, R. War. R., T.F., and to be temp. Capt. whilst so empld., April 11th.

Balloon Co. Comdr.—Graded as a Flt. Comdr.—Sec. Lt. (temp. Lt.) H. P. L. Higman, R.E., T.F., from a Balloon Comdr. (graded as a Balloon Officer), and to be temp. Capt. whilst so empld., April 4th.

Equipment Officer, 1st Cl.—Sec. Lt. (on prob.) H. V. W. Stagg, Spec. Res., and to be temp. Capt. whilst so employed, April 1st.

* * *

WAR OFFICE, April 28th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING. Staff Officers, 2nd Cl.—(Graded for pay as Brig. Majs.)—From Staff Officers, 3rd Cl. (graded as Staff Cpts.):—Lt. (temp. Capt.) T. M. Eggar, Lond. R., T.F., vice temp. Lt. (temp. Capt.) J. B. Solomon, Oxf. and Bucks L.I., March 26th. Lt. (temp. Capt.) G. D. Pidgcon, Spec. Res., April 4th.

3rd Cl. (Graded for pay as Staff Cpts.):—Capt. H. Elwell, R. Suss. R., T.F., and to be secd; temp. Capt. W. B. Adams, attd. S. Staff. R., and to be transfd. to Gen. List; temp. Lt. E. P. Stapleton, R. Fus., to be transfd. to Gen. List, and to be temp. Capt. whilst so empld., Feb. 2nd. Temp. Capt. F. W. Trott,

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M.C., attd. Devon R., and o be transfd. to Gen. List, vice Lt. (temp Capt.) T. M. Eggar, Lond. R., T.F., March 26th. Temp. Lt. G. R. Moser, Arg. and Suth'd Highrs., from an Adj., R.F.C., and to be temp. Capt. whilst so empld., vice-Lt. (temp. Capt.) G. D. Pidgeon, Spec. Res., April 4th.

Flt. Comdrs.—Capt. G. C. Pirie, Sco. Rif., Spec. Res., from a Flying Officer, April 12th. From Flying Officers, and to be temp. Cpts. whilst so empld.:—Sec. Lt. E. E. Pope, Spec. Res., April 13th. Sec. Lt. W. T. Hall, Spec. Res., April 14th.

SCHOOLS OF INSTRUCTION.—SCHOOLS OF MIL. AERO-NAUTICS.—Examining Officer (Graded as an Equipment Officer, 1st Cl.).—Temp. Capt. T. E. Gilmore, Gen. List, from graded as an Equipment Officer, 2nd Cl., March 29th.

* * *

WAR OFFICE, April 30th.

REGULAR FORCES.—The undermentioned N.C.O. to be temp. Sec. Lt.:—

MEMORANDUM.—For duty with R.F.C.—Sergt. Ernest Jones from R.F.C. April 2nd, 1917.

FROM THE COURT CIRCULAR.

WINDSOR CASTLE, April 25th.

The following officer had the honour of being received by His Majesty, when the King invested him with the Insignia of Companion of the Order into which he has been admitted.

THE DISTINGUISHED SERVICE ORDER.

Sec. Lt. William Algie, Northumbeland Fusiliers, attd. R.F.C.

The King then conferred decorations as followed:—

THE DISTINGUISHED SERVICE CROSS.

Flt. Lt. Ronald Graham, R.N.A.S.

THE MILITARY CROSS

Major Horace Davey, North Staffs. Regt., attd. R.F.C.

Major Thomas O'B. Hubbard, R.F.C.

Major Herbert Oxenham, R.F.C.

Capt. William Guilfoyle, R.F.C., attd. Australian F.C.

Capt. Archibald James, Hussars and R.F.C.

Capt. Stanley Muir, Gen. List and Australian F.C.

Capt. John Philpott, R.F.C.

Capt. Bestine Sutton, Yeomanry and R.F.C.

Capt. Frederick Wells, Indian Army, attd. R.F.C.

Lt. Sydney Clarke, Wiltshire Regt., attd. R.F.C.

Lt. Dirk Cloete, R.F.C.

Lt. James Crafter, London Regt., attd. R.F.C.

Sec. Lt. William Poundall, S. Lanc. Regt. and R.F.C.

NAVAL.

ADMIRALTY COMMUNIQUÉS.

APRIL 24th.—The Vice-Admiral at Dover states that he has received a report from Dunkirk to the effect that on the afternoon of April 23rd reconnaissance machines reported the presence of hostile destroyers, and three British naval machines were dispatched to attack them.

Five enemy destroyers were seen at 4.10 p.m. steaming between Blankenburg and Zeebrugge, in a north-easterly direction, five miles off the coast.

The leading machine attacked, dropping 16 bombs, one of which was seen to obtain a direct hit.

The remaining four destroyers scattered and were attacked by and remain stationary after all bombs had been dropped.

The leading destroyer was observed to take a list to port and remain stationary after the bombs had been dropped.

The four destroyers closed on the disabled craft. A hostile seaplane attacked our machines, but was easily driven off.

At 6.10 p.m. four destroyers were reported by reconnaissance machines entering Zeebrugge harbour. It is considered most probable that one destroyer was sunk.

The following promotion has been made in the Royal Naval Air Service:—

APRIL 30th.—Sqdn. Comdr.—E. F. Briggs, D.S.O., promoted to Wing Comdr., seny. Dec. 31st, 1916.

THE CASUALTY LIST.

Reported April 26th.

KILLED.—Jackson, Flt. Sub-Lt. Edward G. G., R.N.

Walters, Assistant Paymaster Raymond A. P., R.N.R.

DIED OF INJURIES.—Bush, Flt. Lt. Richard E., R.N.

SERIOUSLY INJURED.—Russell, Prob. Flt. Officer Edward D. B., R.N.

INJURED.—Turnour, Flt. Lt. (Sub-Lt. R.N.) Edward H. K., R.N.

McConnell, Flt. Sub-Lt. William E., R.N.

Reported April 27th.

KILLED.—Walter, Flt. Sub-Lt. Eric B. J., R.N.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED.—Brimer, Flt. Sub-Lt. Charles T., R.N.

Reported April 28th.

DROWNED.—Meade, Lt. William C. A., R.N.V.R.

Smith, Flt. Sub-Lt. Guy D., R.N.

PREVIOUSLY REPORTED PRISONER, NOW REPORTED KILLED.—Smith, Flt. Sub-Lt. Lewis E., R.N.

Reported April 30th.

KILLED.—Fleming, Flt. Lt. George R. S., R.N.

Donovan, Sub-Lt. Edgar C., R.N.V.R.

PRISONERS.—Rathborne, Wing Comdr. (Lt.-Col., R.M.L.I.) Charles E. H., R.N.

Edwards, Flt. Sub-Lt. Harold, R.N.

PERSONAL NOTICES.

DEATHS.

WALTERS.—Asst. Paymaster Raymond Alfred Price Walters, R.N.R., who was killed in an air fight on April 21st, was the third son of the late J. E. Walters, of Gravesend.

WALTER.—Flt. Sub-Lt. Eric B. J. Walter, R.N., who was killed in action on April 24th, was the son of Lt. Walter J. Walter, R.N.V.R., and Mrs. Walter, of 9, Stockfield Road, Streatham.

On April 27th, at Ingatestone Hall, Essex, a seat of the Petre family, a Requiem Mass was said for Squadron Commander John Petre, R.N., youngest son of Mr. S. H. Petre, who was killed in a flying accident in France. The ceremony was attended by military and R.N.A.S. representatives.

Father Grant officiated. The family mourners were—Mr. and Mrs. S. H. Petre, Miss Petre, Major H. Petre, Lady Young, Sir William Young, Mrs. and Miss Colley, Mrs. Killkelly, Miss Maud Petre, Miss Agnes Petre, Mr. Sibeth, Mr. Albert Sibeth, and Miss Sweetman. Lady Petre was too unwell to attend.

MARRIAGE.

HARVEY—ALLEN.—On April 12th, at St. Mary's Parish Church, Sunbury-on-Thames, by the Rev. P. C. West, M.A., Vicar, Frank Harvey, R.N.A.S., younger son of Mr. and Mrs. Alfred Harvey, Kings Wier, Upper Tooting, was married to Barbara, seventh daughter of Mr. and Mrs. Harry Hull Allen, Sunbury-on-Thames.

BIRTH.

NICOLSON.—On April 29th, at 38, Crediton Hill, Hampstead, the wife of Leslie G. Nicolson, R.N.A.S.—a son.

Squadron-Commander E. Featherstone Briggs, D.S.O., R.N., whose promotion to Wing-Commander was officially notified on May 1st, will be remembered as having been taken prisoner through being shot down on an Avro in the course of the raid on Friedrichshafen, in November, 1914, after which he was imprisoned till recently at the fortress of Ingoldstadt.

He is one of the earliest of Naval aviators, joining the Air Service as an Engineer-Lieut., R.N., in 1912. He is an extremely able engineer, and was one of the first to recognise the merits of the le Rhone engine, breaking the British Height Record with one of these engines early in 1913. His many friends will rejoice in his well-earned promotion.

* * *

Wing Comdr. (Lt.-Col., R.M.L.I.) Charles E. H. Rathborne, R.N., who is now officially reported to be a prisoner of war, is obviously the "lieutenant-Colonel" who was announced by the Germans to have been captured during the reprisal raid on Freiburg on April 14th.

Colonel Rathborne, who is an interpreter in German, was appointed for instruction at the Central Flying School in January, 1913, and subsequently served as Flying Officer at the R.N. Air Station at Felixstowe, under Major Risk, becoming a Flight Commander in August, 1913.

During the present war he commanded a squadron in the combined aeroplane and seaplane operations in the Bruges-Ostend-Zeebrugge district from February 11th to 16th, 1915. Since then he has commanded an Air Station at home.

MILITARY.

G.H.Q. COMMUNIQUÉS.

APRIL 24th, 10.29 p.m.—Yesterday there was a greater amount of fighting in the air than has before taken place in a single day.

Our aeroplanes attacked the enemy's machines wherever they could be found with striking success, going far behind the German lines and bombing his railways, dumps, and aerodromes, and have compelled him to give battle.

In the course of the fighting, 15 German machines were brought down and destroyed and 24 others were driven down out of control, the majority of which probably crashed.

A large twin-engine three-seater German machine was brought down in our lines and its occupants made prisoners.

Only two of our machines are missing.

[The number of our air casualties who are not missing is not stated.—Ed.]

APRIL 25th, 9.5 p.m.—Fine weather enabled our aeroplanes to carry out many raids again yesterday, and bombs were dropped with good effect upon the enemy's railway junctions, aerodromes, billets, and ammunition dumps.

In one raid a large bomb struck the engine of a moving train, blowing the engine off the line and wrecking the train. Hostile troops and transport were also successfully engaged with machine-gun fire.

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There was again a great amount of air fighting, in the course of which seven German machines were brought down out of control. Two German observation balloons were also destroyed.

Six of our machines are missing.

APRIL 26th, 8.24 p.m.—Successful work was carried out by our aeroplanes yesterday, in spite of less favourable weather. In air-fighting two German machines were brought down, one of them falling in our lines, and a third was driven down out of control.

Three of our machines are missing.

APRIL 27th, 8.43 p.m.—Yesterday activity in the air was again marked. In air fighting seven German aeroplanes were brought down and six others were driven down out of control. One hostile balloon was also destroyed.

Six of our aeroplanes are missing.

APRIL 28th, 9.30 p.m.—Three German aeroplanes were brought down yesterday in air fighting and a fourth was shot down by our anti-aircraft guns. One hostile observation balloon was also destroyed.

Three of our aeroplanes are missing.

APRIL 29th, 9.5 p.m.—In air fighting yesterday two German aeroplanes were brought down, and one other was driven down out of control. Three of our machines are missing.

APRIL 30th, 8.40 p.m.—There was great activity in the air yesterday and during the night. Bombs were dropped with effect at a number of points behind the enemy's lines, causing several fires and, in one case, a large explosion. Three enemy trains were also hit by our bombs.

The enemy fought hard to protect the points attacked, and in the course of the fighting 10 German aeroplanes were brought down and 10 others were driven down out of control.

Fifteen of our machines are missing.

WAR OFFICE COMMUNIQUÉS.

The G.O.C. British Forces in Mesopotamia reports:—

APRIL 24th.—Our artillery, assisted by aircraft co-operation, have blown up an ammunition dump in Gaza.

The G.O.C. British Forces in Greece reports:—

APRIL 26th.—Our aircraft carried out a raid on an enemy depot at Cernista (five miles north-west of Doiran town), causing considerable damage, and subsequently dispersed an enemy squadron which was attempting to cross our lines. One of our machines was destroyed.

THE CASUALTY LIST.

Reported April 24th.

KILLED.—Wilson, Lt. A. P., R.F.C.

Wilson, Sec. Lt. C. E., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—

Davies, Sec. Lt. R. W. M., North'd Fus., attd. R.F.C.

Everingham, Sec. Lt. G., R.F.C.

MacKenzie, Sec. Lt. K. I., A. and S. Highrs., attd. R.F.C.

Owen, Sec. Lt. T. J., R.F.C.

Wordsworth, Sec. Lt. J. C. D., Durham L.I. and R.F.C.

WOUNDED.—Balden, Sec. Lt. W. R., R.F.C.

Beynon, Lt. L. F., Monmouth Regt. and R.F.C.

Calvey, Sec. Lt. H. C., A.S.C., attd. R.F.C.

Coates, Capt. L. C., London Regt., attd. R.F.C.

Cotton, Sec. Lt. J. C., London Regt. and R.F.C.

Jennings, Lt. T. N., R.F.C.

Lees-Smith, Sec. Lt. H. S., R.F.C.

Robertson, Sec. Lt. A. G., Black Watch and R.F.C.

MISSING.—Frew, Sec. Lt. J. G. H., R.F.C.

Kimbrell, Sec. Lt. R. E., Hussars, attd. R.F.C.

Langwill, Lt. T., R.F.C.

Muir, Sec. Lt. J. H., R.F.C.

Robertson, Sec. Lt. D. N., R.F.C.

Reported April 26th.

KILLED.—Lockhart, Capt. G. B., Cyclist Bn. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Cravós, Sec. Lt. C. S., R.F.C.

Hamilton, Sec. Lt. E., R.F.C.

WOUNDED.—Green, Sec. Lt. W., Black Watch and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN

GERMAN HANDS.—Holden, Sec. Lt. A., Yorks R., attd.

R.F.C., Shum, Sec. Lt. C. A. R., R.F.C.

OVERSEA FORCES.—MISSING.—Elliott, Lt. J. McC., Gen. List, attd. R.F.C.

ACCIDENTALLY KILLED.—AUSTRALIAN F.C.—Ryder, 941 C. N.

DIED.—AUSTRALIAN FLYING CORPS.—Geary, 1064 A.

Reported April 28th.

KILLED.—Geddes, Major A. C. L., M.C., R.F.C.

CORRECTION.—Russell, Lt. W. O., N. Staffs Regt., attd. R.F.C. (reported missing), should read:—Russell, Lt. W. O., R.F.C.

OVERSEA FORCES.—PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR IN GERMAN HANDS.—Whiteside, Lt. H. S., Canadian M.G. Co., attd. R.F.C.

Reported April 30th.

KILLED.—Sheppard, Sec. Lt. L. C. B., Somerset L.I., attd. R.F.C.

Twidale, Capt. E. A., R.F.A., attd. R.F.C.

WOUNDED.—Brackenbury, Sec. Lt. H. S., R.F.C.

Routh, Capt. E. J. D., K.R.R.C., attd. R.F.C.

Wessel, Lt. F. F., R. Fus., attd. R.F.C.

MISSING.—Crisp, Sec. Lt. A. E., Norfolk R. and R.F.C.

Mitchell, Sec. Lt. J. P. C., Highland L.I., attd. R.F.C.

Morgan, Sec. Lt. A. B., R.F.C.

Newenham, Sec. Lt. G. A., R.F.C.

Strange, Sec. Lt. L. A. T., E. Kent R. and R.F.C.

Rogers, Sec. Lt. C. V. de B., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR IN GERMAN HANDS.—Ryall, Sec. Lt. A. G., Durham L.I., attd. R.F.C.

PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF WOUNDS.—R.F.C.—Bond, 7653 1st Cl. Air Mech. W. H. (Chipping Norton).

WOUNDED.—R.F.C.—Mackie, 23050 2nd Cl. Air Mech. J. T. (Leigh-on-Sea).

CANADIAN FORCES.—KILLED.—Souter, Lt. J. M., Can. Gen. List, attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Love-land, Lt. R., Can. Inf., attd. R.F.C.

WOUNDED.—McKercher, Lt. S., Can. Inf., attd. R.F.C.

Milligan, Lt. C. N., Can. Inf., attd. R.F.C.

Porter, Lt. L. E., Can. Inf., attd. R.F.C.

MISSING.—Rogers, Lt. G. R., Can. Field Artillery, attd. R.F.C. Reported May 1st.

KILLED.—Hesketh, Sec. Lt. J. E. B., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—McNeill, Sec. Lt. D. A., R.F.C.

Smart, Sec. Lt. G. O., R.F.C.

DIED OF WOUNDS.—Cameron, Sec. Lt. R. C., R.F.C.

Young, Sec. Lt. A. C., R.F.C.

ACCIDENTALLY KILLED.—Shimmin, Sec. Lt. T. E., Cyclist Coy. Divl. Mtd. Troops and R.F.C.

WOUNDED.—Andrews, Sec. Lt. F. S., R.F.C.

Beal, Sec. Lt. L. W., R.F.C.

Berry, Sec. Lt. C. W., R.F.C.

Davis, Sec. Lt. J. A., R.F.C.

De Escofet, Sec. Lt. P. A., R.F.C.

Farley, Maj. R. L., R.F.C.

Fletcher, Lt. W. F., R.F.C.

Franklin, Lt. W., Dorset Regt., attd. R.F.C.

McCallum, Capt. K. C., Arg. and Suth'd Highrs. and R.F.C.

Paine, Sec. Lt. J. J., R.F.C.

Pascoe, Sec. Lt. A., R.F.C.

MISSING.—Bevan, Capt. F. H. V., R.F.C.

Craig, Sec. Lt. F. C., R.F.C.

Sadler, Sec. Lt. F., Durham L.I. and R.F.C.

Tolhurst, Lt. B. J., Duke of Wellington's Regt., attd. R.F.C.

Wood, Lt. A. W., R.F.C.

PERSONAL NOTICES.

DEATHS.

BAKER.—Capt. Arthur Forbes Baker, of the Duke of Cornwall's Light Infantry, attd. R.F.C., previously reported missing, but now officially stated to have been killed on April 11th, was the second son of Mr. F. W. Baker, of 10, De Vere Gardens, W. He was educated at Ashdown House, Forest Row, the School of Mines, Camborne, and Trinity Hall, Cambridge. In August, 1914, he was engaged in professional work in Siberia, and when war broke out, returned immediately to England, and was gazetted in October to the D.C.L.I.

In April, 1915, he left for the front, and remained with his regiment on active service until seconded to the R.F.C., acting as observer at the front for five months, after which he returned to England, and in July 1916, received his certificate as pilot. He was employed for some time in a night-flying squadron. He returned to the front in the late autumn, and in March of this year was gazetted flight commander. He was mentioned in dispatches in 1915 for services while with his battalion.

BARLTROP.—Eric Arthur Bartrop, B.A. Cantab, Lieut., R.E., attd. R.F.C., who was killed on April 23rd, was the eldest son of the late Rev. Arthur Henry Bartrop and of Mrs. Bartrop, 12, Albany Road, Bedford. His age was 27.

BARNES.—An inquest was held on April 27th on the body of Sec. Lt. David John Barnes, R.F.C., aged 22, who was killed by the fall of his aeroplane while flying in Kent. The machine was observed to make a spinning nose-dive from a height of 500 ft., and as it struck the earth the petrol tank burst and the aeroplane was burnt. Mr. Barnes was an Australian taking an instruction course. A verdict of accidental death was returned.

CHARLTON-ANNE.—Captain Crathorne Edward Isham Charlton-Anne, R.F.C., youngest son of Major and Mrs. Anne, of Burghwallis, Yorks, is reported missing, and believed to have been drowned on April 15th on his passage to Egypt.

Captain Charlton-Anne was a nephew of Brigadier-General Charlton, Director of Organisation, R.F.C. He was a very promising young officer, and had already distinguished himself on active service. He is a great loss to the Corps.

CLARK.—An accident, resulting in the death of a military aviator, occurred on April 29th at Streatham. Lt. Clark, R.F.C.,

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while flying over Leigham Court Road, Streatham Hill, was forced to descend owing to engine trouble and came into collision with a chimney, causing the petrol tank to explode and burst into flames. The aeroplane then fell on to a private garage, and Mr. Clark was severely burnt about the body. By a tragic coincidence his father, who lives in Leigham Court Road, assisted to extricate his son from the wreckage. The aviator was carried indoors. Unfortunately, he succumbed to his injuries. Local fire brigades were called and extinguished the flames, but the machine was completely destroyed.

DONALDSON.—Sec. Lt. C. T. L. Donaldson, Yeomanry and R.F.C. (killed in action on April 14th), was 20 years of age, and son of the late Archibald Falconar Donaldson, of Donaldson Brothers, shipowners, Glasgow, and of Mrs. Donaldson. He had his Yeomanry commission in March, 1915, and was afterwards attached to the R.F.C.

GREG.—Capt. Arthur Tylston Greg, Cheshire Regt., att'd. R.F.C., killed on April 23rd in an action in the air, was the eldest son of Col. E. W. Greg, V.D. (commanding a reserve battalion Cheshire Regt.), and Mrs. E. W. Greg, of Norcliffe Hall, Styal, Cheshire. He was educated at Rugby School, where he was an officer in the O.T.C., and New College, Oxford. He matriculated at Oxford in March, 1913, and joined the O.T.C.

In August, 1914, he received his commission, and proceeded to the front in September, 1914. While there he was attached temporarily to the Sherwood Foresters, and did duty with that regiment until just before Christmas, 1914, when he was invalided home for a short time. On returning to the front early in January, 1915, he was attached to a battalion of the Cheshire Regiment, with whom he remained until he was severely wounded in November, 1915. On his recovery he rejoined his own battalion, and was promoted Captain in November, 1915.

Later he was appointed battalion bombing officer, and in September, 1916, he was selected as a candidate for the R.F.C. He received his training for this corps in England and France, and was sent out for active service to France in April, 1917.

LILLIS.—Lieut. Martin A. Lillis, Royal Irish Regt., att'd. R.F.C., was the youngest son of Mr. Thomas Barry Lillis, managing director, Munster and Leinster Bank, and Mrs. Lillis, Carrig, Queenstown. He was educated at Clongowes Wood College and Trinity College, Dublin, where he took his degree, and was called to the Bar in 1913.

He entered Sandhurst in 1914, after the outbreak of war, and was attached to the R.F.C., and had been flying at the front since January, 1916. On one occasion, when 6,000 ft. up over the German lines, he had the top of his engine blown away, and managed with great skill to bring his machine back to safety. He was killed on April 11th, at the age of 26.

MACKENZIE.—Keith Ingleby Mackenzie, Sec. Lieut., Argyll and Sutherland Highrs., att'd. R.F.C., who was killed in an aerial fight on April 8th, was the youngest son of Dr. and Mrs. Ingleby Mackenzie, Lansdowne House, Ryde, I.W. He was in his 19th year.

MORRIS.—Lieut. George Tod Morris, R.H.A., att'd. R.F.C., reported missing April 11th, and later reported killed in action on that date, was the youngest son of Mr. and Mrs. James A. Morris, Savoy Croft, Ayr. He was 23 years of age.

PATER.—Sec. Lt. Hugh Pater, West Yorkshire Regt. and R.F.C., who was accidentally killed while flying on April 17th, aged 28, was the eldest son of the Rev. S. Pater, rector of Sunderland. He was educated at Bow School, Durham, under Mr. W. H. Bramwell, and at Rossall School (Mr. Furneau's house). For some years he was a master at the Durham Cathedral choir school, and in Sept., 1914, he enlisted in the Public School Battalion, Royal Fusiliers. In June, 1915, he received his commission in the West Yorkshire Regt. In Aug., 1916, he volunteered for the Royal Flying Corps. On April 14th, he received his certificate of efficiency and was expecting to be sent to the front immediately.

PEACH.—Lt. Crugar Stanley Peach, West Yorkshire Regt. and R.F.C. (accidentally killed), was 20 years of age, and only son of Capt. and Mrs. C. Stanley Peach, of Queensmead, Farnborough, Hampshire. He received the rank of Lieutenant in his regiment on Sept. 6th, 1915, and was attached R.F.C. as an observer in June of last year.

REYNELL.—Sec. Lieut. Frederick Henry Reynell, R.F.C., who was killed in action on April 23rd, was the eldest son of Frederick Reynell, of The Retreat, Wallington, Surrey, and Stock Exchange. His age was 25.

RUSSELL.—Sec. Lieut. P. A. Russell, Yeomanry, attached R.F.C., killed on April 2nd, was the second son of the late P. B. Russell, and of Mrs. Russell, of Lanton, Kirknewton, Northumberland, and was aged 28. Educated at Edinburgh Academy and Sherborne, he joined the Yeomanry on the outbreak of war, and later proceeded to Gallipoli, where he took part in the Suvla landing and the subsequent evacuation. He took his pilot's certificate in September, 1916, and proceeded to another front in October, 1916. He was a member of the Duke of Buccleuch and North Northumberland Hunts, and was a prominent rider at the Border Hunt Steeplechase at Kelso.

SPENCE.—Sec. Lt. A. W. Spence, R.F.C., who died from injuries received in an accident while flying in Kent, was 21 years of age. He was the younger son of Mrs. Spence and the late John Spence, of The Gables, Grove Park. He was educated at Haileybury College, and joined the Army on the outbreak of war. Mr. Spence served in France for many months in the Middlesex Regiment. Invalided home last year, he transferred to the R.F.C. Recently he was given his wings.

TWIDALE.—Capt. E. A. Twidale, R.F.A., attached R.F.C., killed on April 22nd, was the eldest son of Mr. Ashby Twidale, Niagara Falls, Ontario, and a grandson of the Rev. Joseph Twidale, of Melton Mowbray. At the outbreak of war, he enlisted in the Canadian Forces in the Eaton Machine-gun Battery, in which he was made Sergeant. While in England he was offered a commission in the R.F.A., and proceeding to the front in March, 1916, he was through the Somme advance and was promoted to Captain in September, 1916. He joined the R.F.C. Kite Balloon Section last January. Capt. Twidale was a B.Sc. of Toronto.

WILL.—Lieut. John George Will, R.F.C., who was posted as missing some weeks ago, is now reported to have been killed in action on March 25th. He was second son of Dr. and Mrs. Will, of Bethnall House, Cambridge Road, and won fame at Merchant Taylors' School and at Downing College, Cambridge, in both scholarship and sport. In Rugby football he possessed gifts for half and three-quarter back play that secured for him his blue as a Freshman in the Cambridge Fifteen, and caps for Scotland in the International matches of 1912 and 1914.

His years in the Cambridge Fifteen were 1911, 1912, and 1913, and he was captain elect of the Cambridge R.F.U. when war broke out. In his Freshman's days at Cambridge Will played flying half, but afterwards he became a dashing left wing three-quarter, and played many great games in that position for Cambridge and for Scotland.

Before joining the Royal Flying Corps he served with the Leinsters, and was wounded.

WILSON.—Sec. Lt. Cecil Eustace Wilson, R.F.C. (killed in action on April 16th), was second son of Mr. Henry W. Wilson, Heathcote, York Road, Sutton, Surrey. He was 23 years of age, and had his commission in September 1916.

YOUNG.—Lt. Young, R.F.C., of Tadcaster, was killed on the outskirts of Hull on May 29th. He passed over a residential suburb at a low altitude, having suddenly dropped out of a cloud with the machine almost upside down. The aeroplane partly righted, but afterwards crashed in some allotments. The pilot died before he could be taken to the infirmary.

ENGAGEMENTS.

ANNANDALE—CALDWELL.—An engagement is announced between Arthur James Annandale, Sec. Lt., Royal Irish Rifles, attached R.F.C., son of the late Mr. James Hunter Annandale, of Polton, Midlothian, and of Mrs. Annandale, and Theodora Lindsay, only child of Colonel A. L. Caldwell, Army Service Corps, and of Mrs. Caldwell, and granddaughter of the late Right Rev. Bishop Caldwell.

BROCK—CAREY.—A marriage has been arranged, and will shortly take place, between Lt.-Col. Henry Le M. Brock, D.S.O., Royal Warwickshire Regt. and R.F.C., third son of the Rev. and Mrs. H. Walter Brock, of St. Peter-in-the-Wood, Guernsey, and Daphne, elder daughter of Mr. and Mrs. Cecil A. Carey, of Hauteville, Guernsey.

COOPER—LUCAS.—An engagement is announced between Major Howard Lister Cooper, R.F.C., and Nan Ino, Baroness Lucas. The marriage will take place shortly.

COX—WARNER.—A marriage has been arranged, and will take place in June, between Major Geoffrey Henry Cox, North Staffordshire Regt. and R.F.C., and Eileen, youngest daughter of Mr. R. S. Aucher Warner, K.C., and Mrs. Warner, of Trinidad, West Indies, and 193, Ashley Gardens, S.W.

MARRIAGES.

CADMAN—JOHNSON.—On April 25th, at Holy Trinity Church, Llandudno, by the Lord Bishop of St. Asaph, assisted by the Rev. Ll. Hughes, Rector of Llandudno, and Canon Roberts, Richard Cadman, Lieut., R.F.C., youngest son of the late Mr. J. C. Cadman, of Newcastle, Staffs, was married to Eileen Mary, eldest daughter of Mr. and Mrs. E. W. Johnson, Bryn-y-Bia, Llandudno.

HOOPER—HALL.—On April 19th, at Henbury, near Bristol, by the Rev. C. P. Way, Capt. Clifford A. Hooper, R.F.C., younger son of Mr. and Mrs. H. S. Hooper, Shenstone, Staffs., was married to Janet Ashley, only daughter of Mr. and Mrs. J. Ashley Hall, of Cherry Orchards, Westbury-on-Trym.

PICKTHORN—BELL.—On April 28th, at St. Mary's, Wimbledon, Charles Murray Pickthorn, M.C., Capt. R.F.C., second son of the late C. Wright Pickthorn and Mrs. Pickthorn, of W. Kensington, was married to Bessie Dorothy Batten Bell, elder daughter of the late William Bell, of Belfast, and Mrs. Batten Bell, Wimbledon.

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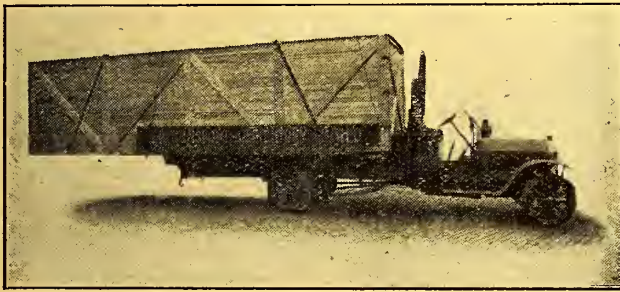
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BIRTHS.

DEES.—On April 23rd, at 13, Prince's Gate, Hyde Park, to Ruby, wife of Adrian Dees, R.F.C.—a daughter.

GARNETT.—On April 23rd, at Bushwood, Edgbaston, to Sybil, wife of the late Lt. W. H. Stuart Garnett, R.F.C.—a son.

MORTON.—On April 21st, at 13, Prince's Gate, S.W., the wife of Capt. A. R. Morton, Canadian Contingent, attached R.F.C., a son.

REDGRAVE.—On April 26th, at 3, St. Stephen's Avenue, West Ealing, to Muriel, wife of Gilbert E. Redgrave (Sec. Lieut., R.F.C.), a son.

SCHOLTE.—On the 26th inst., at Woodside, Charing Cross, McCudden, R.F.C., killed whilst flying a Blériot monoplane at daughter.

IN MEMORIAM.—In memory of the late Flight-Sergt. W. T. J. McCudden, R.F.C., killed whilst flying a Blériot monoplane at Gosport on May 1st, 1915. R.I.P.

Two officers of the R.F.C. were seriously injured in a flying accident on the South Coast on May 20th. The occupants of the aeroplane were Capt. Vincent and Lt. Patterson. They were making a practice flight, and when a short distance up the machine fell, through some cause as yet unexplained. Medical assistance was forthcoming, and the injured officers were removed to a neighbouring military hospital.

It was reported from Amsterdam on April 27th that according to information received, which is not official but appears to be trustworthy, Capt. Leefe Robinson, V.C., R.F.C., who was recently reported to have been shot down on the Western front, is a prisoner of war and unaccounted for.

The following advertisement appeared recently in various Irish papers, and may be of interest to any Irish readers who have not seen it:—

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[This is, one imagines, the first example on record of the British Army advertising for officers.—Ed.]

Mr. W. S. Massey, writing of the fighting in Mesopotamia on April 21st, says:—

"A counter-attack from Hareira did not materialise, because of our aerial activity. A machine on reconnaissance brought in news of the approaching attack. From a certain spot four machines with 48 bombs and an escorting aeroplane, went forth to deliver a loud message to Hareira. They found about 3,000 infantry and 800 cavalry drawn up in a wadi in mass, awaiting the order to move. The escorting aeroplane soared high to spot, while the bombers swooped down to take accurate aim. The escorter says that 47 out of 48 bombs fell direct on the troops,

The special correspondent of the "Morning Post," writing from France on April 25th says:—

"The sky was full of fighting aeroplanes. The British machines, sailing through groups of shrapnel bursts, kept darting down on the advancing enemy, firing point blank their machine-guns when only a few hundred feet away.

"Other machines diving dizzily until the black cross on their upper wings came into view—Aviatik and Albatros battleplanes—wheeled and dropped behind our lines as the muffled, helmeted figures behind the swivel guns searched for our hidden batteries

[This remark assists to dispel the popular newspaper article of faith that the German pilots never come behind the British lines.—Ed.]

Apropos the fighting round Oppy on April 29th, the "Daily Mail" correspondent at G.H.Q. says:—

"It is inevitable that such attacks (by German destroyers on British observation machines) should be the battles chiefly seen by infantry in our trenches. They do not see the 60 tons of bombs dropped at night miles over the enemy's lines; they seldom see our fighting men's pursuit of the German fighters or watch our triplanes towering and swooping and chasing. 'As soon as I saw one of these after me I thought it best to come down,' said a very dashing German pilot who dodged our air patrols and got through miles behind our line, and down he came.

[This is the first mention of triplanes on active service.—Ed.]

"We hold again the mastery of the air. Whether we keep it depends, first and foremost, on the activity of the factories at home."

[But more so on the Supply Department of the Air Board.—Ed.]

FRANCE.

OFFICIAL COMMUNIQUÉS.

APRIL 23rd.—ARMY OF THE ORIENT.—Artillery actions along the whole front. A German bombarding aeroplane squadron was compelled by British aircraft to turn back.

APRIL 24th.—ARMY OF THE ORIENT.—British aircraft drove off some enemy aeroplanes and bombarded enemy depots at Sestovo.

APRIL 25th.—During April 23rd and 24th six German aeroplanes were brought down in aerial fights by our pilots. In addition, 16 other enemy machines were seen to fall in their lines seriously damaged.

Between April 16th and 22nd our pilots appreciably increased the number of their exploits. Sous-Lt. Dorme brought down his 19th and 20th enemy machines; Sous-Lt. Doullin his 14th; Lt. Pinsart (or Piusard) his 9th and 10th; Sous-Lt. Tarascon his 10th; Sous-Lt. Languedoc his 6th and 7th; and, finally, Adjudant. Lufbery has brought down eight machines up to date.

ARMY OF THE ORIENT.—An enemy aeroplane fell in flames in the region of Doiran.

APRIL 27th.—During Thursday three German aeroplanes were brought down by our pilots and six others were seriously damaged and were either obliged to land or fell in their own lines.

During the night of the 26th one of our bombarding squadrons dropped numerous bombs on the railway stations and bivouacs in the region of Ribemont and Crécy-sur-Serre (respectively north and east by north of La Fère.)

APRIL 28th.—During April 27th two German aeroplanes were brought down in aerial fight and six others were forced to land damaged. It is confirmed that four German machines which were reported as disabled were really brought down by our pilots, one of them on April 24th and the three others on April 26th.

APRIL 30th.—During April 29th our pilots brought down four German aeroplanes, and six other enemy machines, badly hit, fell in their own lines or were obliged to descend.

Our bombarding machines dropped bombs on the aviation grounds at Colmar, Habsheim (south-east of Mulhouse), and Frescaty (south-west of Metz). The railway stations of Ars (south-west of Metz), Noveant (south of Ars), Amagne and Lucuy (Aisne), Bétleville and Pont-Faverger (east of Reims), and some enemy bivouacs were also successfully bombarded.

During the night enemy aeroplanes dropped several bombs in the regions of Dunkirk, Nancy, and Belfort. There were no victims, and the damage done was insignificant. Châlons and Epervier (south of Reims) were also bombarded. There were a number of victims among the civil population.

On the night of April 28th-29th our bombarding aeroplanes carried out several operations. A captive balloon on the ground and the sheds of its crew were bombarded. A fire was seen to break out and explosions were heard.

In addition, the railway stations of Pont Faverger and Bétleville (both north-east of Reims) and the bivouacs near Epoye (east of Reims) received numerous projectiles.

GERMANY.

OFFICIAL COMMUNIQUÉS.

APRIL 25th.—FRONT OF CROWN PRINCE RUPPRECHT.—In connection with the operations of the 23rd, occupants of the trenches and infantry aviators report that the number of British dead and wounded lying in front of our lines is unusually high.

FRONT OF DUKE ALBRECHT.—On the 23rd the British and French in aerial fighting lost 20 aeroplanes and one captive balloon. On the 24th 19 of their aeroplanes were encountered for; 16 were brought down in aerial combats and three by the fire of our anti-aircraft guns. Lt. Bernert brought down his 20th, 21st, and 22nd adversary.

During one of our counter-thrusts near Gavrelle, Capt. Zorer, the leader of a reserve squadron, flew in front of the storming infantry at a height of 150 metres (about 500 feet) and from his aeroplane fired at the English with his machine-gun.

APRIL 26th.—FRONT OF DUKE ALBRECHT.—Yesterday the enemy lost six aeroplanes, of which Lt. Schaefer brought down two, his 22nd and 23rd.

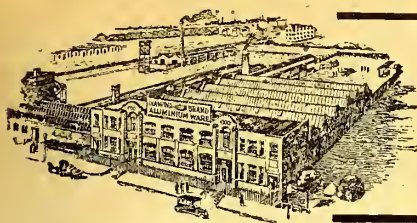
APRIL 27th.—On April 25th, between the Vardar and Lake Doiran, two British aeroplanes were brought down.

In the West the enemy lost 11 aeroplanes (nine of which fell in air combats) and two captive balloons. Lt. Wolff was victorious for the 21st time in an air battle.

APRIL 28th.—After an air battle a Russian aviator fell behind our lines.

German seaplanes on Thursday last successfully dropped bombs on the port installations of Sulina (at one of the mouths of the Danube in Roumania). Big fires were seen to break out in the harbour district and on some lighters. All our seaplanes returned safely, despite violent enemy anti-aircraft fire.

FRONT OF DUKE ALBRECHT.—Three enemy aeroplanes were brought down by anti-aircraft fire and two captive balloons by air attack.



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APRIL 30th.—On April 28th, on the Western front, the enemy lost 11 aeroplanes, and on the 29th 23 aeroplanes, in addition to three captive balloons. Our aviators and anti-aircraft guns shared in this result. [These figures cover British and French losses.—Ed.]

Baron von Richthofen achieved his 48th, 49th, 50th, 51st, and 52nd aerial victories, and Lieut. Wolff, belonging to his chaser section, shot down five enemy machines, thus securing his 26th victim.

Reconnoitring raids and flights for the purpose of dropping bombs took our aviators deep into the area of France occupied by the English between the Somme and the sea, and from the Aisne front beyond the Marne in a southerly direction.

BALKANS.—Between Lake Prespa and the Tchernia there has been lively artillery activity.

Two English aviators were shot down by one of our battle squadrons during its return from a successful aerial attack against the camp and railway lines in the Tchernia bend.

RUSSIA.

OFFICIAL COMMUNIQUÉ.

APRIL 27th.—In the region of Stanislaw the enemy artillery brought down one of our airships, which fell in our lines. The machine was wrecked, but the crew were saved.

ITALY.

OFFICIAL COMMUNIQUÉS.

APRIL 25th.—On the Julian Alps front numerous aerial reconnaissances have taken place. An enemy aeroplane was brought down within our lines, and the wounded aviators were taken prisoners.

APRIL 26th.—Hostile aircraft continued active yesterday on the Trentino front, and as far as the upper valleys of the Carnia. Our machines attacked them vigorously and made reconnaissance flights as far as Brixen and Franzensfests (Southern Tirol).

Enemy seaplanes dropped bombs on San Canziano (mouth of the Isonzo) without doing damage or causing casualties. During an air fight an enemy machine was brought down; it fell in the neighbourhood of San Martino on the Carso. One of the aviators was killed and the other wounded and taken prisoner.

APRIL 26th.—On the Trentino front the aircraft activity has considerably increased.

Our aeroplanes bombarded the railway works of Reifenberg (Gorizia-Trieste railway) with good results and all returned safely to our own lines. During the night one of our airships dropped 600 kilos (about half a ton) of high explosive on the stores and sheds in the neighbourhood of Nabresina (Gulf of Trieste). The airship was discovered during its return by a squadron of enemy aeroplanes, but ascended rapidly into the clouds, thus avoiding attack, and returned safely into our lines.

APRIL 28th.—In the course of yesterday there was persistent artillery and aerial activity on the Trentino and Carnia fronts.

APRIL 29th.—On the 28th enemy aviators dropped bombs on Ala (Val Lagarina) and on Fiera di Primero (Cismon-Brenta Valley) without, however, causing any damage.

APRIL 30th.—During the night enemy aeroplanes dropped bombs on hamlets on the Lower Isonzo, causing slight damage. In reply (? two) of our seaplanes at once started out and bombed the enemy's aeroplanes base near Trieste; both returned safely.

BELGIUM.

OFFICIAL COMMUNIQUÉ.

APRIL 29th.—Our aviators made numerous reconnaissances over the enemy lines last week, and more than a hundred chasing expeditions, in the course of which 20 air fights took place. Two enemy machines were brought down in the German lines.

TURKEY.

OFFICIAL COMMUNIQUÉS.

APRIL 25th.—Two of our aviators, Lts. Felmy and Falke, landed in the desert behind the British lines and destroyed a water conduit which the British had laid.

APRIL 30th.—On April 28th Capt. Schutz brought down in an air fight his eighth enemy aeroplane (a British machine from Liverpool), which fell behind our lines. The pilot, who was wounded, was taken prisoner.

BULGARIA.

OFFICIAL COMMUNIQUÉ.

APRIL 25th.—Near Sejdeli (six miles south-west of Lake Doiran) an enemy aeroplane was brought down by artillery fire.

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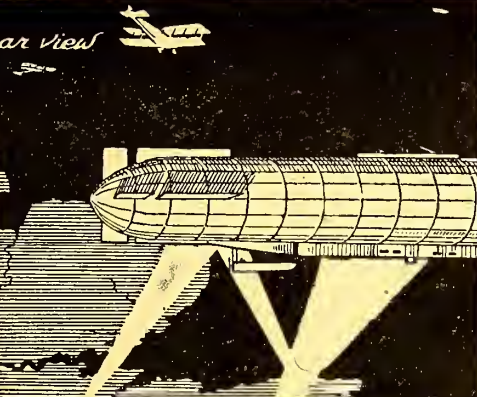
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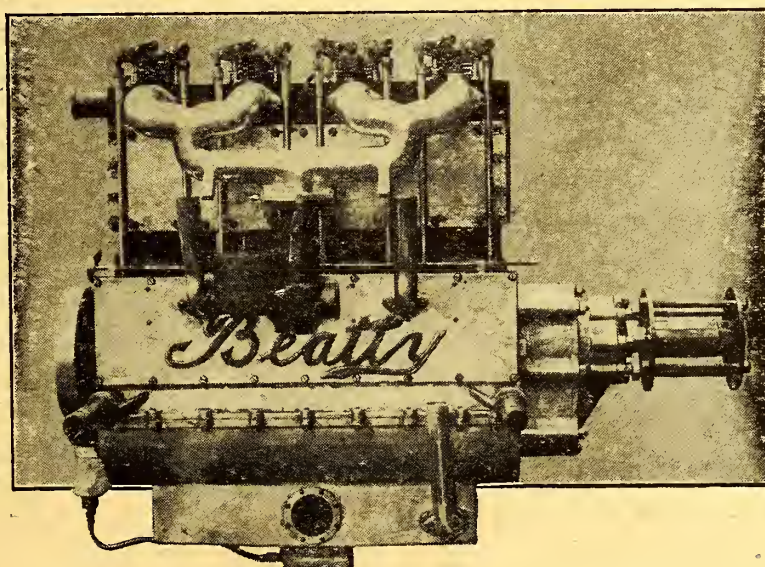
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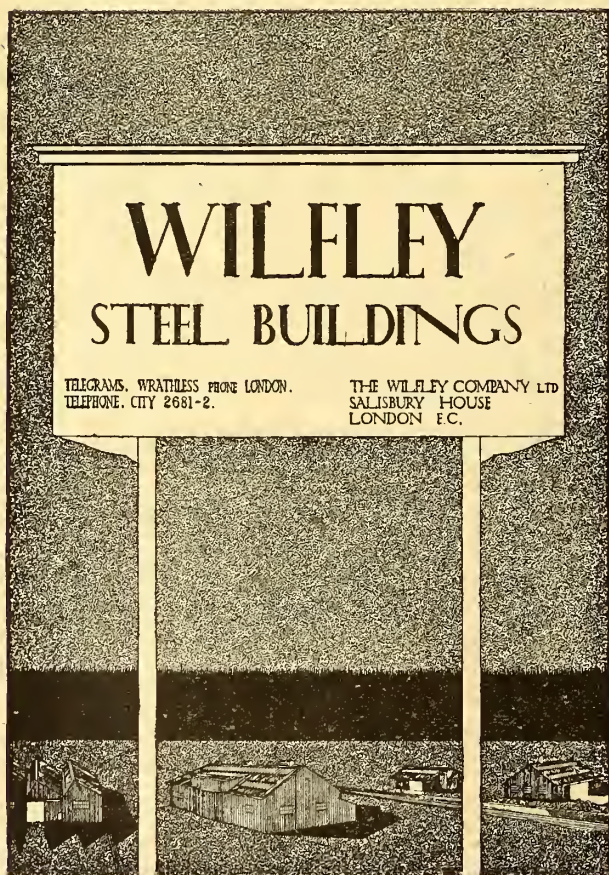
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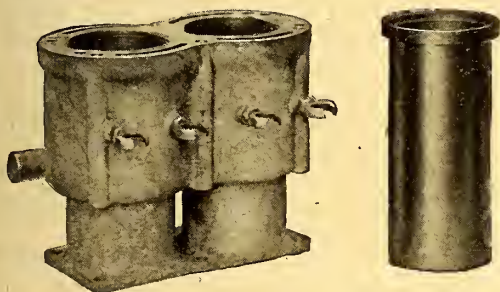
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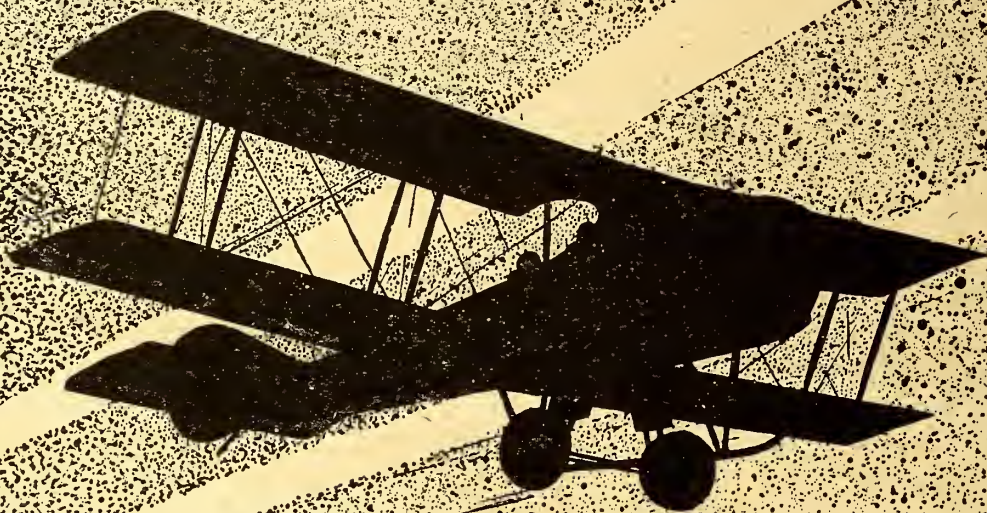
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ON AMERICA'S OPPORTUNITY.

In two recent issues of this paper reference has been made to the immense possibilities of the United States as a source of supply of aircraft, and as a large quantity of aircraft properly used can assist directly in the defeat of the enemy it seems well to discuss the question further.

Imprimis it is evident that America cannot put an army of any considerable dimensions into the field for many months to come. The training of infantry and of a commensurate force of artillery is a long job. The manufacture of sufficient arms and ammunition for the former and guns for the latter, together with the necessary transport, ambulance equipment, and so forth, is bound to take a considerable amount of time. And when all is ready there is still the question of the safe transport of troops and munitions to Europe.

One assumes that it is on the West Front that an American Army would desire to operate, for racial and political reasons, though doubtless it would have equal effect in winning the war if sent into action on an Eastern Front. And in the latter case perhaps transport might be safer, owing to the absence of enemy submarines in the Far East. But in any case, if the enemy's submarines should still be operating with their recent virulence at such a distant date as that on which an American Army of considerable size could possibly be ready for transport to Europe, one may safely assume that things in Western Europe will be in a pretty bad way.

It has been stated in various public prints that there is a shortage in the world's harvests, so it is evident that the submarine menace cannot be defeated by merely building ships quicker than they can be sunk. The ship which is sunk may be replaced in a few weeks, but the food which it carries to the bottom with it cannot be replaced for at least a year. Therefore the first thing to do is to get rid of the submarines.

Let us then consider America's position in view of the two facts that first of all America wants to help as quickly as possible in shortening the war, and that secondly whatever America sends to Europe to help in shortening the war has to arrive there safely. One may state the position briefly by saying that America's task lies firstly in clearing the sea, and secondly in clearing the air.

CLEARING THE SEA.

Firstly as to clearing the sea. It must be evident to the meaneast official intelligence, than which there appears to be no lower grade this side of the tropics, that the seaplane is the natural enemy of the submarine. The long morning and evening calms of the summer, and the short nights, are peculiarly favourable to the submarine. They are still more favourable to the seaplane. Not only can the seaplane use the water as a resting-place and so conserve its fuel supplies, or alight

to refill from a store ship, when in rough weather it would be compelled to fly the whole time, but a calm surface makes it easier for the crew to see the wake of a periscope, or to see the shape of a submarine below the surface.

Now America produced the first seaplane that ever flew. It was built and flown by my esteemed friend Mr. Glenn Curtiss, in California, some time in November of 1911. Since then America, again through Mr. Curtiss, has produced the flying boat, and has developed it to sizes not publicly known in any other country.

Many other firms in America have produced satisfactory flying boats, as well as seaplanes with floats. Therefore it seems probable that American manufacturers can produce quickly a number of seaplanes of considerable value in operating against submarines. Naturally a number of them will be required for patrolling the American coast, now that Hun submarines have taken to operating in American waters, but there should still be a surplus for use in Europe. Or let us perhaps say also on the European half of the ocean, for with a properly organised system of seaplane-carrying ships it should be possible to patrol the regular steamship lanes, and to convoy ships practically continuously.

GUNS.

Moreover, America possesses the only gun publicly known as being capable of firing from an aeroplane a shell capable of sinking a craft at sea. The fact that such a gun would only have to be fired almost vertically downwards removes the aviators' objection to it as a gun for ordinary air fighting, and makes it peculiarly suited for the destruction of submarines.

This point is specially worth consideration by the American authorities, for whatever objections there may be to such a gun it seems to have greater chances of hitting so small a mark as a submarine than has any bomb. Anyhow, the projectile starts with considerable initial velocity, and it is not necessary to manoeuvre a whole aeroplane to the one solitary Euclidean point in the whole atmosphere at which a bomb-trigger must be pulled in order to hit the minute mark offered by a partially emerged submarine.

ENGINES.

One of America's chief difficulties hitherto has been the production of a light and reliable aero engine, such as those featherweights used in the best European machines. When American engines have been reliable they have been somewhat heavy, and where they have been light they have been unreliable.

Now in a seaplane intended solely for submarine strafing weight does not matter so much, because there is no need for it to climb over 500 feet or so. Moreover, the bigger the aeroplane the bigger the useful load

which it can carry in proportion to the weight of its own structure, so that a seaplane, which is not required to climb high in any case, can afford to give away a pound per horse-power or so, without seriously decreasing its usefulness. Therefore it seems that America can find the necessary engines for such work.

PERSONNEL.

No very extended training is needed for such work as anti-submarine patrols. Some ability in navigation, the ability to fly (there is no need for fancy flying), and the ability to shoot straight are about all that are necessary.

If the personnel could be recruited entirely from young men who have been concerned with the sea, either as yachtsmen or as fishermen, so much the better. One imagines that quite a number of useful pilots could be recruited from the younger, more active, and more enlightened men of such places as Gloucester and Marblehead, who have had enough deep-sea fishing to enable them to feel at home on a big sea in a small boat. The man who has handled a dory in a fog on the Banks would not feel particularly unhappy in a well-found flying boat, especially if he had an auxiliary water-screw and could get rid of his wings, in the manner proposed for Mr. Pemberton-Billing's Super-marine of 1913 or so, in case of failure of his main engines.

It appears that, if the U.S. Navy sets to work seriously on such problems as these, it may do much to clear the seas, provided it leaves the management of the business in the hands of active-service fliers and practical aeroplane builders, and carefully avoids saddling itself with a number of experts who only occupy official positions because they have failed to convince business men of their ability to do anything better worth while.

CLEARING THE AIR.

Next let us consider the question of clearing the air.

The other day a perfectly good American citizen said: "The proudest day of my life will be when I see Teddy Roosevelt marching down Regent Street at the head of the boys who have come to fight for the Allies in this war!" Why he fixed on Regent Street is not clear, seeing that the Mall and Parliament Street are our "Triumphal Ways," but he meant well. However, when I asked him whether he would not be a deal prouder to see a huge American air fleet blowing Essen and Krupp's Works to blazes, he admitted that it would be more useful and might make him prouder. There you have in a nutshell—America's great opportunity of helping to end the war.

And the job can be tackled even before the submarine trouble is abolished, simply because it would be a heap easier to transport 10,000 aeroplanes (let us say), and 5,000 pilots, and 50,000 mechanics, and their necessary stores to Europe than it would be to transport 500,000 horse, foot, and guns, with their necessary transport and the impedimenta of a mobile army. Forbye, I believe that 5,000 aviators properly organised, well equipped, and intelligently handled, could do more to stop the war than 500,000 bayonets, and could be produced in a fraction of the time. Here is why:—

THE REASON FOR RAIDING.

The Germany Army exists in France because of its mechanical equipment, and for no other reason. Man for man, the French and British troops are its betters. Its guns, its machine-guns, its railways, its motor transport, and its mechanical effects generally are what enable it to maintain its position. Destroy the sources of that mechanism, and the German Army is beaten. Bomb-

raiding on railways, roads, bridges, ammunition-dumps, and so forth within the "Zone of the Armies"—as the French call it—are tactical operations within the scope of the Allies' Flying Services.

Destroying sources of supply outside that zone is a matter of strategy, which has so far been left untouched for all practical purposes, chiefly, one hopes, because there have never been enough aircraft available for the purpose.

Reprisal raids seem to me to be merely silly. They are justifiable enough on moral grounds, if one particularly wants to import morality into war—which is subject for argument—for we have scriptural warrant for the policy of "an eye for an eye and a tooth for a tooth," but it is doubtful whether they pay. Lord Curzon and Lord Milner say that reprisals are effective, but I fancy that both these noble lords will agree that destruction of sources of supply would be still more effective.

Now, seven-eighths of the enemy's engineering works are west of a line drawn north and south through Berlin, and at least half of that engineering area, including considerably more than half of Germany's iron and coal mines and blast furnaces and steel works, are within easy flying distance of the French frontier. The Breybach Valley and the Briey Basin generally are only the other side of the wall, so to speak, and that area alone supplies the majority of certain ores which are essential to the arming of Germany's troops. That whole area could be absolutely laid waste.

Already we hear of a certain shortage of ammunition and of new artillery among the German troops in France, and if that shortage can be increased the result will be felt promptly. Destroy the operating machinery of the mines, destroy the blast furnaces, destroy the steel works, destroy the power stations, and you destroy at the same time the output of shells, guns, locomotives, rails, motor wagons, and everything which enables the German Army to hold its own. Deprive the German Army of that support, and it is bound to crumple up.

THE MORAL EFFECT.

Close down the mines and workshops, and you throw hundreds of thousands of people out of work. Put those same people in terror of their lives by continual raids and you break their nerve. Being idle, for lack of material or because of smashed workshops, they will meet together and discuss their grievances against the Government which drew them into the war, and they will set about ending the war by trying to end the Government, and they might conceivably succeed in doing so.

Before the war Socialism was stronger in Germany than in any other country in the world. The Socialists looked like sweeping the country at the next election, and the attempt by the Junker and military classes to swamp Socialism in a wave of Jingo patriotism was one of the chief reasons why the war began when it did, before Germany was fully prepared to strike at her enemies. Socialism is still strong in Germany, and moderate Democrats are almost certainly on the side of the Socialists in wishing to end the war if it can be ended without the utter destruction of Germany. The jingoism of the early days of the war is not now so apparent in the German Press, and it occurs to one that Democratic ideals can be hammered into German heads to-day with bombs better than by any other means.

At present the German people feel safe behind the sure shield of the unbroken German Army. Show them that they also are in the battle-field and that their Army cannot protect them, and they will lose faith in Hindenburg and in their Good Old German God.

PLAIN LOGIC.

Let us clear our minds of cant. In this war there is no such thing as a non-combatant. Every man and boy not in uniform in every belligerent country is making munitions of war, or helping someone who is making munitions of war, or producing food for soldiers or sailors or munition makers. Every woman is making munitions, or feeding or clothing munitions makers, or nursing soldiers back to health so that they can go and fight again, or she is the potential mother of another soldier. And so, being combatants, they are liable to be killed, reasoning by any system of logic you like to produce.

And those who are not helping their own country to win the war to the best of their ability, either directly or indirectly, are unpatriotic, and ought to be killed off any way. So whichever way you look at it there is nothing morally wrong in killing people who do not happen to be in uniform, for the more you kill the shorter will be the war. Therefore the sooner big air raids begin on the enemy's territory the better.

AMERICA'S RESOURCES.

The European Allies, as I have said, need all their aeroplanes and pilots for the regular work of their Armies and Navies, and have none to spare for bomb-raiding on a worth-while scale. But America starts with a clean sheet, free from aerial commitments to any Army of definite size, with the experience of all the Allies at her disposal, and with a population which includes thousands of young men peculiarly suited to precisely the kind of adventure provided by carrying such aerial war into enemy country, unhampered as it is by duties concerned with troops on the ground.

America's aviators have always been among the most daring; one might even charge them with recklessness. There are thousands of such men available if the call is sent out for them. Five thousand, or even a thousand of them, continually pouring hundreds of tons of high explosives onto Germany's sources of armament production, and doing it on a properly organised system, so that the assault never ceased, would go far towards winning the war.

We have it on the unimpeachable authority of Major Baird, the Parliamentary Secretary of the Air Board, that it takes 26 hours in the air to produce a trained aviator—besides the time spent in making him a soldier, which is nearer 26 weeks, one imagines. In this country, if a pupil-aviator gets an hour a day in the air, he is doing well, but America can pick and choose her weather according to the season, and can keep her schools in full blast where flying can go on all day. Therefore an American can learn to fly in a much shorter over-all time than is possible anywhere in Europe outside the great central plains of Germany and Austria.

THE SIMPLICITY OF TRAINING.

Also, the French and British aviator has to learn all about a soldier's job, so that he can co-operate with troops on the ground, whereas if one had merely to train a young army of bomb-dropping pilots the time could be cut down to a fraction of that now required.

Even if one had to train a proportion of picked men in air fighting, so as to act as escorts to the bombers, one could omit entirely their training in reconnaissance, photography, gun-spotting, bomb-dropping, and so forth, and so by concentrating on the one job they could be turned out quite efficient at that job very much more quickly than if they had to have an all-round training.

Therefore, if the American Army were to concentrate on sending to Europe a huge fleet of bomb-droppers, with sufficient fighting pilots and machines to protect

them, she could have that fleet in action many months before she could train even an equal number of infantry and gunners to the pitch at which they would be fit for their jobs.

EUROPEAN PATTERNS.

America has at her disposal—presumably—all the experience of the European Allies in building aeroplanes fit for war. Her existing aeroplanes are quite good enough for training pilots in their early stages, and such types can be turned out in thousands, like Ford automobiles, if the American Army sets about the work with proper engineer assistants.

The output of one existing factory alone should be enough to train some thousands of pilots up to the point at which they can safely be trusted to find their way across country to a given point and pull the trigger of a bomb-release gear when they get there—for, be it remembered, a wholesale bombing job such as this does not demand the accuracy of the man who is trying to sink a submarine.

Meantime other factories can turn out the actual bombing machines to the best European designs. There are in the hands of the Allies examples of the most successful German bombers, both the big twin-engined, twin fuselage type, and the 200-h.p. single motor type. Italy's triple-engined Capronis have done great execution on Austrian ports and munition works. France with the twin-engined Caudrons and other big machines has done good work. Great Britain also, with big multiple-engined machines, such as the Handley Page, and large single-engined machines, has had much experience.

All this accumulated knowledge is presumably available to America on terms advantageous to both parties. At any rate, the Parliamentary Secretary of the Air Board has stated that every assistance will be given to America, and one feels sure that British Aircraft Constructors will do their best to help, by forming business alliances with reputable American firms.

As in the case of seaplanes, the big bomb-droppers can afford to give away a trifle of weight in their engines, in return for reliability, so that the very big machine is obviously better suited to American needs and capabilities than is the one-man-one-bomb type of craft.

THE STRAIGHT LINE OF ACTION.

Therefore everything points to the line of action hereinbefore indicated as being that along which America can advance with the best results to the Allies and to her own future place in history. In a very able article published some time ago, Earl Percy demonstrated historically how in all the great European Wars of the past England has waited till the other belligerents had fairly well exhausted themselves, and has then sailed in with a few men and settled the issue according to her liking, ending up with her foot triumphantly on the neck of the humbled foe, complete with Union Jack and bulldog as fitted. I do not venture to suggest that the noble lord expressed it in that way, but the sum of his arguments amounts to that.

It now seems to be the turn of the United States to play a similar part. None will raise any violent objection to Columbia doing a triumphal dance on Germany, accompanied by the Star-Spangled Banner and the American Eagle, if thereby the Hun can be properly humbled and rendered innocuous for a generation or two. Anyhow, the American is distinctly of Anglo-Celtic-Latin descent, and is less Hun than anything, so it seems fitting that the children of Western Europe should have the settling of the business for the countries of their ancestors.—C. G. G.

AN INDEPENDENT AERIAL OFFENSIVE.

BY "BERKELEY."

The birth and early growth of each new weapon of ordered warfare is attended by universal criticism formulated on the lowest and least coherent series of arguments available at the moment. Vivid imagination mingles dreams of future possibilities with the practice of the present. When experience is meagre, all opinion has a hearing uninterrupted by the definite ruling of facts. Limitations are too readily forgotten or ignored, and the axiom of to-morrow is made the burning question of to-day. The visions of active intelligence are so far in advance of the record of daily achievement that satisfaction is always lacking. Those in whose hands lies the development of the new warlike invention lose credit because their means do not permit of a victory over time. Perhaps it is well that external criticism should possess this fault of judging the known present by the possible future, for it permits of no laggard step nor inactive brain. It keeps the pace constant at the highest pitch.

The science of aeronautics attained practical success at too late a date to permit of a clear co-ordination of its military possibilities in time of war. Hostilities are nearing the conclusion of their third year, and yet of necessity there are many possible strategical employments of aircraft which have had no trial of sufficient duration to be of value. The technical efficiency of the aeroplane is in the same stage of development as is its strategic and tactical position. In both stages it is in that state in which very rapid advance is made, and in consequence nothing appears settled for more than a

few days. But not only is its military and naval use, in the contracted sense of the words, not yet entirely codified, but the broad question is not settled as to whether aircraft are exclusively to be considered as parts of the Army and the Navy, or as, in addition, the basis of a new service with specific duties of its own.

The recent debate in the House of Commons on the Air Services illustrates vividly the present position. Members who desire to make criticism, constructive or destructive, of the administration of the two aerial arms pertaining to the Army and the Navy a means for their advancement in political life, gentlemen who understand aerial problems but cannot understand the political life, gentlemen who are fascinated by the romance of the subject and whose knowledge is romantic, and gentlemen who, because of their sins or their unwary sympathy, must defend the ever-attacked departments controlling the design, manufacture, and use of aircraft, all debated at great length and in varied manner the problem of the air. Each view on each of the varied sections of the subject was put forward in entirely different form, and there was little common ground of agreement. But as some of them demanded an independent aerial offensive, an Air Service which would rank with the Army and the Navy, this article will deal with that point alone.

Party government delights in half-measures, for in the ensuing failure all can be held equally to blame. If the plans fail from lack of boldness, His Majesty's Ministers say with regret that had their opponents given them



From a Photograph received from a Neutral Country.

THE FRONT PART OF A GERMAN FIGHTING BIPLANE.—The absence of excrescent gadgets is notable when compared with the Officially Designed and Standardised British machine illustrated last week. It is also worth while to note how well all the weights are massed together, to give handiness in control.

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a free hand all would have been well. If, on the other hand, the failure is due to ill-advised energy of action, they can say with equal sorrow that the opposition forced the pace. But it is only so with half-measures. Any action based on inherent boldness must stand or fall by itself. None but those who initiated it can share the blame and reap the reward.

THE AERO-ULTRA-MARINE.

When aeroplanes became possible as a weapon of war, Lt.-Col. Seely propounded a scheme by which a joint Flying Service should be brought into being, units of which might be used alternately either by the Army or the Navy. Its personnel, drawn from both sources, were to live in perfect amity and with diluted knowledge equal to all emergencies. The Royal Flying Corps in its inception combined parts of all theories, sections of all practice. Those who loved the Army, those who loved the Navy, and those who dreamt of a separate Air Service were all to be happy because each found some of their theories put into action. As might be expected, none was pleased. The cherished ideals of each were ruined because all shared the particular coloured result. And in practice the original theory was overthrown. The Naval and Military Wings, already separate in administration, separated in name and in operations. Rivalry took the place of amity, and all vision of a single Air Service vanished.

In the war aeroplanes took their part as do "guns" and "wagons, G.S." Reconnaissance, strategical and tactical, spotting for artillery, bomb-dropping as a part of general military operations, and the aerial fighting which came as a result of urgency of the other work, occupied all the available matériel and personnel. The Royal Naval Air Service, had its machines been suitable, would have assisted the ships at sea. In the lack of sufficient development this corps did in effect chiefly assist the Army in such non-technical operations as were suitable to their gifts.

In the early days a few air raids, aimless in their infrequency and lack of cohesion, were made by naval aeroplanes over German towns guilty of harbouring the nocturnal Zeppelin. Damage was done, and at little loss. But the moral effect was negligible, for they never came again, and popular memory is short. And all the time the work of the Army proceeded steadily and surely.

OUR SUPERFLUITY.

We were short of everything when the war began, save newsprints and politicians, but most of all we were short of aircraft. The Army grew with incredible swiftness, and the flying arms increased steadily. But neither then nor now has the Army enough aeroplanes and pilots for even the routine duties of the common day. The losses in aerial fighting are heavy, and the new machines specially produced for fighting duties further reduce the supplies available for the first military duties of aircraft.

The work done is marvellous, but, if the supply of men and matériel were adequate, the results even from routine work alone (in reconnaissances and spotting) would have a supreme effect on the duration of the war. On the German side a new offensive robs other sectors of the greater part of their aerial forces in order that a concentration in force may be made over the desired position. There is little reason to believe that other armies in the war are more fortunately placed in regard to aircraft. But there is no margin anywhere for work not closely allied with the operations of the moment. No delightful expeditions of destruction to Berlin can be undertaken, and Vienna must perforce be left secure in its splendid isolation.

This lack of military aeroplanes for the work of the army in the field either does not appeal to certain critics

at home, or in their wisdom they hold that the wrong policy is adopted, and that an alternative scheme, drastic in its measures, would produce immediate and important results.

The latter views in their most concrete form favour the formation of a Third Service—that of the air—subject neither to the Army nor the Navy, and carrying out an individual and separate offensive possibly as a part of a general scheme of war laid down by an effective War Cabinet capable of co-ordinating the political and military considerations of the situation in being. The war would be carried beyond the land defences into the enemy country by the aircraft of this service, and the inhabitants of the attacked country would be discouraged and dismayed by active instead of passive agencies.

THE PROCLIVITIES OF THE PRESS.

The Imperial Air Service—to give it a name beloved of the public prints—would presumably possess a General Staff or War Staff of its own, with special and direct knowledge of the problems affecting the employment of aircraft. Any schemes promulgated would be orderly and continuous in their effect. The Army and the Navy would have no share in the direction of the Third Service, which would be independent in training and in operations. The two older services would have aerial arms of their own, sufficient in strength for the required duties.

The Third Service would produce aeroplanes and train personnel with the declared intention of raiding by air the principal towns of the enemy country. The seat of government, the great munition areas, the colliery districts, the railways would all be objects of consistent and continuous attack. The naval bases such as in this present war, Wilhelmshaven, Heligoland, and Zeebrugge, would never be left in peace, and the submarine menace would be destroyed at its source. Day by day, as a part of a concerted scheme, the training centres of enemy troops would be bombarded from the air that the young soldier might know the earliest unhappiness of war.

The vision is attractive, and it is easy to imagine the result if such an offensive could be made during the present year. But "if" has worried other people than Mr. Rudyard Kipling.

The first obstacle in the way of the scheme is that neither the machines nor the men are available. The country's resources are taxed to the utmost in order to comply with the demands of the Army and the Navy. Neither of the belligerents has time or matériel to spare from the present fields of action. If, as one member of Parliament declares, such a fleet as is desired could be prepared in six months, then it would be better employed with the armies in the field.

COUNTER MEASURES.

Offensives of this nature have only one answer from the enemy—the preparation of a similar force. The underlying belief of the optimists who most readily criticise the authorities is that such raids would be made without effective opposition, though they never make such a statement in words. They speak of bombing Essen, but they say nothing of enemy counter-measures. Such operations might become an expensive side issue of the war without seriously affecting its duration or result.

The second consideration that appears is whether on analysis of the various duties proper to such a Third Service they cannot properly be divided between the existing services, and whether all aircraft raids should not form a consistent part of military or naval operations in being. Accepting for a moment that, though at present the Army lacks aircraft to undertake additional spheres of activity, there will be at a date in the



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immediate future a number of aeroplanes in excess of routine requirements. There is then no apparent reason why military aircraft should not take an increased part in the general offensive.

THE FUNCTION OF BOMBERS.

Should this position be attained, large forces of aeroplanes could be used consistently and continually, not to bomb enemy towns far behind the line of battle, but to crumple up the forces in the field. The enemy need be given no rest. His strategic railways could be attacked continuously, and his stores of munitions constantly destroyed. His reinforcements, attacked with precision, would be discouraged before they meet their earthly foes. This, again, is assuming that our aerial forces gain supremacy over those of the enemy, and can in consequence carry out unhindered such offensive schemes.

The Navy, on the other hand, would employ its aerial arm in attacks on enemy ports and bases, on bomb raids over great towns, and in the elimination of the submarine.

By expanding the present organisation and refraining from the formation of a Third Service, the technical direction of war remains in fewer technical hands, which in itself is a decided gain. The air is common to both land and sea, and aerial offensives depend for ultimate success on

naval and military operations. Under present conditions and those of the immediate future an aerial service could not carry out a successful invasion. It could attack, but not occupy. The land forces are necessary to consolidate the gains.

The aerial arms as parts of the existing services would be in a more favourable position in the matter of personnel. The higher branches of military training, whether it concerns a sailor, a soldier, or an aviator, are the same in fundamental principles. An aviator bears much the same relation with the rest of the Army as does a cavalryman. And it is perhaps well to retain the present intimate connection between the aerial arm and its earthly brethren.

Roughly it would appear that at present it would be wasteful to divert aeroplanes from their present duties to the prosecution of an aerial offensive, which, even if successful, would be vastly expensive. All parts of an aerial offensive are subject to naval and military strategical requirements. Expansion on the present lines would leave the higher direction of war in fewer hands. The Editor is not in agreement with these arguments, and it is possible that opposition to them is general. But they are none the less sincere.

[The Editor happens to be in perfect agreement, but he regards the use of bombing machines slightly differently.—Ed.]

AEROPLANE RAIDS ON ENGLAND.

Readers of this paper, at any rate, cannot have been surprised at the aeroplane attack on London on Sunday night. It is only surprising that such an attack was not made quite a long time ago. It may be well, however, to ask readers to deprecate any agitation on the part of the ill-informed who argue that such raids ought to be prevented.

As General Brancker pointed out at the Aeronautical History Exhibition, raids by aeroplanes are very much harder to tackle than raids by airships, and the remedy he then put forward is the proper one—namely, to hit so hard at the places whence such raids originate that the enemy will not dare to start. These raids must start either from aerodromes in Belgium or from the sea. In the former case an active and efficiently organised offensive policy by our own Flying Services in Flanders can make it impossible for the enemy to assemble in Belgium any fleet of raiding machines of such size as to have any appreciable effect on this country, though it may be impossible to stop sporting lone-hand raids such as this last example.

In the event of really big raids by some dozens of aeroplanes taking place, owing to lack of preventive organisation in Flanders, they will doubtless be met by an organised defence such as that which dealt so successfully with the Zeppelin nuisance, and one hopes that the same able officers may be entrusted with the job. The task is made the more possible by the fact that only a very limited area of the country is within the reach of such attacks.

If such raids were attempted by seaplanes starting from points near our coasts, it would be necessary for such craft to be conveyed across the North Sea by surface-ships of some kind, or on the decks of submarines. In such events it would be necessary for these ships to get past our patrol flotillas, so that it is almost inconceivable that any considerable number of aircraft could be launched for the attack without being caught by our coast-patrols, both sea and air, especially as such a raid would almost certainly happen on a moonlight night.

Therefore there seems no reason for excitement over the raid which has taken place, nor over the prospects of any which may possibly take place in future. Never-

theless, knowing the fondness of those in high places for neglecting to anticipate the obvious, and their love of combating an evil after it has occurred in preference to merely preventing it, one may as well point out that it will be wise to assure the destruction of all German aerodromes which are within the radius of a return-ticket, so to speak, to any munition area in South-Eastern England, and to keep a watch on moonlight nights by means of seaplane patrols against any attempts to launch seaplanes near the coast.—C. G. G.

THE TORPEDOING OF THE "GENA."

So much fuss has been made by the lay Press about the torpedoing of the S.S. "Gena" that it may be well to make clear the position as regards torpedo aeroplanes. In its usual ill-informed way the Press assumes that these are something startlingly new. The only wonder is that the Hun has taken so long to use them.

The Admiralty, displaying unusual intelligence, has issued a notice to the effect that this method of attack was first practised successfully in August, 1915, by Royal Naval Air Service pilots, who sank several ships in the Dardanelles by torpedo from seaplanes. The first instance of such success was, I believe, the sinking of a Turkish transport in the Marmora by Flight Commander (now Squadron Commander) C. H. Kingsman Edmunds, R.N., a performance for which that capable young officer was awarded the D.S.O., the citation in the "Gazette" stating at the time that he had sunk the ship with a "projectile from a seaplane," the nature of the projectile not being specified. The fight involved taking a Short seaplane over the Gallipoli Peninsula, without any excess of power, and was, therefore, of considerable merit. It was stated afterwards that the transport was lying in shallow water, and though she sank was not submerged.

Experiments in launching torpedoes from seaplanes were begun as early as 1913, the first trials being made with a Borel monoplane on the surface of the water, as the machine could not lift the weight of the torpedo. During 1914 continual work in this direction was carried on, and users of Southampton Water were quite familiar with torpedo-carrying seaplanes three years ago.

If I am not misinformed there is a British patent in existence, standing in the name of Capt. Murray F. Sueter, C.B., R.N., for the dropping of torpedoes from seaplanes. There is also an American patent for the same object taken out a year or two ago.

The fact that nothing has been heard of the use of torpedo-aeroplanes by the R.N.A.S. may presumably be ascribed in fairness to the fact that there have been no German vessels afloat on the High Seas against which it was possible for them to operate. One would be paying the Fifth Sea Lord and his staff a poor compliment if one did not assume that they are fully alive to the possibilities of the torpedo-seaplane as a means of sinking enemy ships in open roadsteads, or even in harbours, and thence one may assume that with the development of seaplanes in the hands of intelligent people something useful along these lines may be expected—either in this war or the next.—C. G. G.

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AN INTERESTING FUNCTION.

On May 5th the Imperial Air Fleet Committee gave a complimentary luncheon to various persons interested, at the Connaught Rooms, Kingsway, W.C., to celebrate the presentation to the South African Government of an aeroplane named "South Africa," a subscription for which was raised by the London Chamber of Commerce. The President of the Imperial Air Fleet Committee, the Rt. Hon. Lord Desborough, K.C.V.O., acted as host, and the principal guest was Lieut.-Gen. the Rt. Hon. J. C. Smuts, K.C.

Mr. Lionel Martin, Chairman of the Council, London Chamber of Commerce, in handing over the aeroplane to the Imperial Air Fleet Committee, spoke in high praise of the manner in which South Africa had driven the enemy out of her own country, and had come forward to help in the struggle for liberty.

Lord Desborough reminded the audience of the early part which South Africa had taken in appreciating the military possibilities of the aeroplane, and pointed out the excellent work done by her aviators in German East Africa, German West Africa and in France.

General Smuts, in acknowledging the gift, referred to what Lord Desborough had said in regard to South Africa's appreciation of the possibilities of the aeroplane, and related how in 1912 the Union made provision in the Defence Act for the establishment of an air fleet as part of the defence system. They started schools in South Africa and trained a number of aviators whom they sent to England for finishing touches.

He said that people in South Africa may claim some credit for prevision. They saw that the aeroplane was going to be a very important instrument in war, and a number of machines of new type were ordered. General Smuts felt extremely flattered when the War Office said that they could not spare these machines because they were so good that they preferred to keep them for France. (Laughter.) He had great difficulty in getting some of these machines for German South-West Africa, but it was not a campaign in which the aeroplane could fully be used.

He said that in German East Africa the difficulties were even greater, for it was "still bushier, more afforested," and as it lay at a great elevation to begin with, aviators had to fly very high indeed to be beyond the reach of guns. For all that, excellent scouting work was done by the South African Flying Corps and also by aviators belonging to the R.N.A.S.

The General described the discovery of the "Königsberg" by aeroplane and her consequent destruction—[Pity there were no torpedo-seaplanes there.—Ed.]—and also narrated how, owing

to German foresight in building in peace time larger ships than had the Belgians, on Lake Tanganyika, they were thereby able, with the use of the heavier guns which could be carried, to dominate 750 miles of the frontier. When, however, the Belgians, with great difficulty and perseverance, got some seaplanes all the way up the Congo river, right across the African Continent, the situation was quickly changed.

In conclusion, General Smuts referred to his visit to the Western front at a time when the arrival of new and up-to-date German aeroplanes seriously threatened British air supremacy. These new machines which the Germans brought forward were very fast and very deadly, but "our boys" made the most gallant fight possible, even when flying in inferior machines.

General Branker expressed the thanks of the War Office to the donors of the new air unit. As to our supremacy, not once had the Germans prevented our aviators from performing their duty to the Army, and after hard and bitter fighting for two months they had gained the upper hand of the Germans. Success had come earlier than he had hoped for, and the output of our new aeroplanes and engines was improving, and he hoped would soon be much better if the labour troubles, which again threatened, were settled. The present success in the air might be only temporary, and efforts to improve and extend it must go on incessantly. (Hear, hear.) He thought the aeroplane was the antidote to the submarine.

After lunch the guests adjourned to the Hendon Aerodrome, and Captain Hucks, R.F.C., took the machine for its first public flight, with Lord Desborough as passenger, and gave a magnificent demonstration of what a really first-class modern aeroplane, designed with an eye to effectiveness as well as efficiency, can do. It may be as well not to mention the actual type of machine, but it was one of the finest productions of the Aircraft Manufacturing Co. Ltd., and designed by Captain Geoffrey de Havilland, R.F.C.

During the afternoon flights were made by various other aeroplanes, and the congregation had an opportunity of viewing a double-engined Handley Page biplane at an altitude of some 90 ft. above their heads.

One was just a little surprised to notice a row of the very latest things in fighting aeroplanes drawn up for inspection in the aerodrome, although, actually, they attracted curiously little attention, which, perhaps, was just as well.

The whole afternoon was a great success and reflects considerable credit upon Mr. C. J. Fairfax Scott, the hon. secretary of the Imperial Air Fleet Committee.—W. L. W.



SCENES IN AN AIRCRAFT FACTORY.—XV.—AN OFFICIAL VISIT BY THE CONTROLLER OF FRENCH-NAIL AND TIN-TACK SUPPLIES, COMPLETE WITH WIFE AND SUITE.—Strict instructions have been given to employees not to stare at the distinguished visitors, but to go on with their work as if nothing were happening. The order is obeyed literally by the sweeper in the foreground, to the discomfort of the Gentleman-in-Waiting behind him, to whom the Managing Director is displaying due civility. To the left, a lady worker whose pocket discloses a letter to "Miss Parker," is endeavouring to see the Controller through the back of the Works' Manager, who is explaining the firm's latest product enthusiastically to the Great Man and his Lady. A mechanic, busy operating on a tin-tack, is too interested in the visitors, with dire results to a strut. The Works' Adonis steadies the machine in a graceful attitude. The propeller swinger forgets the man on the top plane, and a plank-carrier also forgets to notice how he is turning. Meantime the Official Escort nobly does its duty on the right, albeit one of them is disguised in the effective manner well known to motorists.



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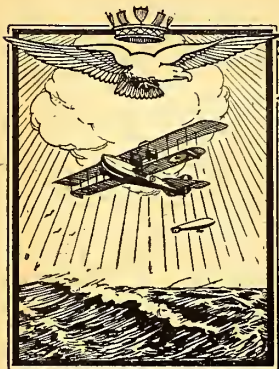
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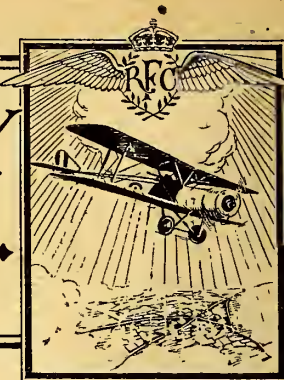
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FROM THE "LONDON GAZETTE."

R.N.A.S.—Sqn. Comdr. E. F. Briggs to be Wing Comdr.
Dec. 31st, 1916.

ADMIRALTY, April 27th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
Adj.—Lt. G. W. Panter, R. Ir. Rif., vice Capt. E. F. Campbell, K.R. Rif., March 26th.

Flt. Comdrs.—Lt. (temp. Capt.) E. E. N. Burney, M.C., R. Berks R., from a Flying Officer, April 13th. From Flying Officers, and to be temp. Capt. whilst so empld.:—Sec. Lt. (temp. Lt.) F. D. Pemberton, R.A.; Sec. Lt. G. A. H. Pidcock, Spec. Res., April 14th; temp. Sec. Lt. K. Capel, Gen. List, April 16th.

MEMORANDA.—The undermentioned temp. Hon. Lts., Gen. List, to be temp. Hon. Capt. (without the pay or allowances of that rank) whilst empld. as Insps., Aeronautical Inspn. Dept., April 1st, 1917:—A. Boor, T. Greening, H. E. Fozard, G. T. Smith-Clarke.

* * *

The following are among the Decorations and medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign. The King has given unrestricted permission in all cases to wear the Decorations and medals in question:—

Conferred by the President of the French Republic.

CROIX DE GUERRE.

Temp. Sec. Lt. J. L. Bamford, Gen. List, attd. R.F.C.
Lt. (temp. Capt.) A. D. Bell-Irving, M.C., Gord. Highrs., Spec. Res., and R.F.C.

Sec. Lt. V. W. B. Castle, R.F.C., Spec. Res.
Lt. (Temp. Capt.) J. A. G. De Courcy, M.C., R.A., and R.F.C.
Temp. Sec. Lt. R. V. Franklin, Gen. List and R.F.C.
Sec. Lt. (temp. Capt.) J. W. Gordon, R.F.C. Spec. Res.
Temp. Sec. Lt. C. H. Marchant, Spec. List and R.F.C.
Sec. Lt. (temp. Capt.) R. J. Mounsey, Hamps. R. and R.F.C.
Temp. Sec. Lt. H. L. Pateman, Spec. List and R.F.C.
Temp. Lt. (temp. Capt.) J. B. Quedsted, A.S.C. and R.F.C.
1983 Sgt. A. Armstrong, R.F.C.
7216 Sgt. C. J. Butler, R.F.C.
896 Sgt. E. J. Farley, R.F.C.
23897 Sgt. E. Handley, R.F.C.
635 Sgt. P. M. Veitch, R.F.C.

MEDAILLE MILITAIRE.

297 Act. Sgt.-Maj. (now Sec. Lt.) J. P. Angell, R.F.C.
10606 Sgt. L. S. Court, R.F.C.
5223 Sgt. G. R. Horrocks, R.F.C.
5954 1st Cl. Air Mech. (now temp. Sec. Lt.) J. L. Miles, R.F.C.
8193 1st Cl. Air Mech. W. E. Lowrie, R.F.C.
6671 1st Cl. Air Mech. C. R. Tweeddale, R.F.C.

* * *

WAR OFFICE, May 2nd.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Flt. Comdr.—Sec. Lt. (temp. Lt.) C. Dunlop, Yeo., T.F., from a Flying Officer, and to be temp. Capt. whilst so empld., April 13th.

Equip. Officers, 1st Cl.—Sec. Lt. (temp. Lt.) F. C. Rowe, Spec. Res., from the 2nd Cl., and to be temp. Capt. whilst so empld., April 9th.

* * *

WAR OFFICE, May 3rd.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Wing Comdr.—Maj. (temp. Lt.-Col.) C. Saunders, D.S.O., Dorset Regt., from Comdt., Staff Officer, 1st Cl. (graded as an A.A.G.), and to retain his temp. rank whilst so empld., Apl. 23rd.

SCHOOLS OF INSTRUCTION.—SCHOOLS OF MILITARY AERONAUTICS.
—Comdt., Staff Officer, 1st Cl.—(Graded as an A.A.G.)—Maj. (temp. Lt.-Col.) B. R. W. Beor, R.A., a wing Comdr., and to retain his temp. rank whilst so empld., vice Maj. (temp. Lt.-Col.) C. Saunders, D.S.O., Dorset Regt., April 23rd.

WAR OFFICE, May 4th.

REGULAR FORCES.—STAFF.—The following temp. appts. are made at the War Office:—

Dir.—Bt. Lt.-Col. W. B. Caddell, R.A., from an Asst. Dir., and to be temp. Brig.-Gen. whilst so empld., vice Bt. Lt.-Col. D. S. MacInnes, C.M.G., D.S.O., R.E., April 4th.

Asst. Dirs.—From Dept. Asst. Dirs., and to be temp. Lt.-Cols. whilst so empld.:—Temp. Maj. T. E. St. C. Daniell, M.C., Gen. List; Sec. Lt. (temp. Capt.) C. H. Whittington, R.F.C., Spec. Res., March 21st.

Dep. Asst. Dirs.—Temp. Capt. H. M. Bentley, Gen. List from an Equipment Officer, 1st Cl., R.F.C., vice Sec. Lt. (temp. Lt.-Col.) C. H. Whittington, R.F.C., Spec. Res.; Sec. Lt. F. B. Burton, R.F.C., Spec. Res., from a Staff Lt., and to be temp. Capt. whilst so empld.; temp. Capt. R. H. Austin-Sparks, Gen. List, from a Dep. Asst. Dir. (graded for pay as a Staff Capt.); temp. Lt. (temp. Capt.) H. A. P. Disney, Camb. R., T.F., from a Staff Capt., and to retain the temp. rank of Capt. whilst so empld., vice temp. Maj. (temp. Lt.-Col.) T. E. St. C. Daniell, M.C., Gen. List, March 21st.

D.A.A.G.—Maj. G. A. Travers, Res. of Officers, from Staff Capt., April 17th.

Staff Capt.—Sec. Lt. (temp. Capt.) P. C. A. Bridgeman, A.S.C., T.F., from an Equipment Officer, 2nd Cl., R.F.C., and to retain his temp. rank whilst so empld.; temp. Lt. B. J. Wolfe-Barry, Gen. List, from a Staff Lt., and to be temp. Capt. whilst so empld.; temp. Lt. W. A. W. Hallam, Gen. List, from a Staff Lt., and to be temp. Capt. whilst so empld.; temp. Capt. W. H. Ewen, Gen. List, from an Equipment Officer, 1st Cl., R.F.C., vice temp. Lt. (temp. Capt.) H. A. P. Disney, Camb. R., T.F.; Capt. R. W. Thomas, Lond. R., T.F., from an Equipment Officer, 2nd Cl., R.F.C.; temp. Capt. H. E. A. Lindsay, Gen. List, from an Equipment Officer, 3rd Cl., R.F.C., March 21st. Capt. J. C. Wickham, D.S.O., R.E., April 17th. Sec. Lt. (temp. Capt.) J. Dickson, S. Afr. Def. Forces, from an Equipment Officer, 1st Cl., R.F.C., and to retain his temp. rank whilst so empld., May 1st.

R.F.C.—MIL. WING.—Park Comdr.—Sec. Lt. (temp. Capt.) C. Jarrott, R.F.C., Spec. Res., from an Equipment Officer, 1st Cl., and to be temp. Maj. whilst so empld., March 21st.

SCHOOLS OF INSTRUCTION.—SCHOOL OF AERIAL GUNNERY.—Instr.—(Graded as an Equipment Officer, 1st Cl.)—Sec. Lt. (on prob.) (temp. Lt.) J. A. Cooper, Yeo., T.F., from an Asst. Instr. (graded as an Equipment Officer, 2nd Cl.), and to be temp. Capt. whilst so empld., April 3rd.

* * *

WAR OFFICE, May 5th.

REGULAR FORCES.—STAFF.—R.F.C.—MIL. WING.—Staff Officer, 3rd Cl. (Graded for pay as a Staff Capt.)—Capt. A. W. A. Harker, R.A., and to be sec., Jan. 24th.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Flt. Comdr.—Sec. Lt. D. J. Bell, Spec. Res., from a Flying Officer, and to be temp. Capt. whilst so empld., April 9th.

Balloon Co. Comdr.—(Graded as a Flt. Comdr.)—Sec. Lt. (temp. Lt.) J. R. Bedwell, R.G.A., T.F., from a Balloon Comdr. (graded as a Balloon Officer), and to be temp. Capt. whilst so empld., April 15th.

* * *

WAR OFFICE, May 7th.

REGULAR FORCES.—The following N.C.O. to be Sec. Lt. in the Field:—

MEMORANDUM.—For Duty with R.F.C.—Actg. Sgt.-Maj. T. Bell, from R. F. C., April 3rd.

The following man to be a temp. Sec. Lt.:—

THE ARMY SERVICE CORPS.—1st Cl. Air Mech. A. S. Hansford, from R.F.C.

REGULAR FORCES.—STAFF.—Asst. Dir.—Major J. G. Weir, R.F.A., T.F., from a Dept. Asst. Dir. (graded for pay as a Staff Capt.), and to be temp. Lt.-Col. whilst so empld., March 21st.

Dept. Asst. Dir.—(Graded for pay as a Staff Capt.)—Sec. Lt. (temp. Capt.) M. O. Darby, R.F.C., Spec. Res., from a Staff Capt., and to retain his temp. rank whilst so empld., March 21st.

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Staff Capt.—Temp. Capt. H. J. Page, Lond. R., T.F., from Staff Lt., and to be sec'd., vice Sec. Lt. (temp. Capt.) M. O. Darby, R.F.C., Spec. Res., March 21st.

Staff Lts.—Capt. P. A. Denny, Arg. and Suth'd Highrs., and to be sec'd., vice temp. Capt. H. J. Page, Lond. R., T.F., March 21st.

ESTABLISHMENTS.—MIL. WING.—Flt. Comdr.—Sec. Lt. (temp. Lt.) R. W. P. Hall, R.F.A., T.F., from a Flying Officer, and to be temp. Capt. whilst so emp'd., April 20th.

Park Comdr.—Capt. W. E. G. Statter, R. Lanc. R., from an Equipment Officer, 1st Cl., and to be temp. Maj. whilst so emp'd., April 19th.

Equipment Officers, 1st Cl. (and to be temp. Capt. whilst so emp'd.).—Temp. Hon. Lt. A. R. Howard, Gen. List, March 17th. Temp. Lt. L. Y. K. Murray, Gen. List, from a Flying Officer; Sec. Lt. (temp. Lt.) J. McCrae, Sea. Highrs., from an Equipment Officer, 2nd Cl., April 19th.

FROM THE COURT CIRCULAR.

WINDSOR CASTLE, May 2nd.

The following Officers had the honour of being received by the King, when His Majesty conferred upon them the Military Cross. Sec. Lt. Walter Buntine, Sherwood Foresters, att'd. R.F.C. Sec. Lt. James Cassels, Royal Sussex Regt., att'd. R.F.C.

NAVAL.

ADMIRALTY COMMUNIQUÉ.

MAY 2nd.—The British s.s. "Gena" was sunk yesterday (Tuesday) by a torpedo discharged from a German seaplane off Aldeburgh.

All hands were saved.

Another seaplane concerned in this attack was brought down by gunfire from s.s. "Gena," and the crew were made prisoners.

[See German communiqué of same date.—Ed.]

The following promotion has been made in the Royal Naval Air Service:—

MAY 5th.—Flt. Comdr.—R. J. J. Hope-Vere, promoted to rank of Act. Sqdrn. Comdr., sen. Feb. 21st.

THE CASUALTY LIST.

Reported May 2nd.

ACCIDENTALLY KILLED.—Collins, Flt. Sub-Lt. Ronald F., R.N.

ACCIDENTALLY INJURED.—Brown, Flt. Lt. Leslie O., R.N.

Reported May 3rd.

MISSING.—Hood, Flt. Sub-Lt. Thomas S. S., R.N.

Bennett, Flt. Sub-Lt. Samuel L., R.N.

Fletcher, Flt. Sub-Lt. Albert H. V., R.N.

Cuzner, Flt. Sub-Lt. Albert E., R.N.

WOUNDED.—Haywood, Flt. Sub-Lt. Arthur P., R.N.

KILLED.—Chivers, A., C.P.O., 3rd Gr., F.671; Farquhar, D., Ldg. Mech., F.3707; Monro, J., Atr Mech., 2nd Gr., F.21840.

WOUNDED.—Carder, A., Air Mech., 1st Gr., F.2290; Ecroyd, G., P.O. Mech., F.9844; King, A. E., Air Mech., 1st Gr., F.4373; Kirby, F. C., Air Mech., 1st Gr., F.3813; Vaughan, K. M., P.O. Mech. F.1467.

MISSING.—Danzey, W. C., Aircftmn., 2nd Gr., F.15990; Watson, R. H., Ldg. Mech., F.3307.

Reported May 7th.

KILLED.—Gaskell, Flt. Sub-Lt. H. L., R.N.

Ellis, Mr. F., Gunner, R.N.

DIED OF INJURY.—Grundy, Prob. Flt. Officer H. E., R.N.

Usborne, Sub-Lt. C. H., R.N.V.R.

INJURED.—Gillman, Prob. Flt. Officer L. E. M., R.N.

Buck, Flt. Sub-Lt. A. F., R.N.

MISSING.—Mather, Flt. Sub-Lt. A. S., R.N.

Malone, Flt. Sub-Lt. J. J., R.N.

Roach, Flt. Sub-Lt. E. D., R.N.

WOUNDED.—Anson, Lt. G. F. V., R.N.V.R.

Shields, Flt. Sub-Lt. D. M., R.N.

Reported May 8th.

KILLED.—Berridge, Flt. Sub-Lt. R. W., R.N.

PERSONAL NOTICES.

DEATHS.

BERRIDGE.—Flt. Sub-Lt. Raymond Winchester Berridge, R.N.A.S., who was killed in action on May 4th was the son of Winchester and Alice Berridge, The Hawthorns, Gerrards Cross, He was 19 years and 11 months of age.

* * *

GASKELL.—Flt. Sub-Lt. Holbrook Lance Gaskell, R.N., whose death in action is officially announced to-day, was born in 1897, and was the youngest son of Lt.-Col. and Mrs. J. B. Gaskell, of Roseleigh, Wootton, Lancashire. He was educated at Greenbank School, Sefton Park, Shrewsbury School, and was entered at Pembroke College, Cambridge, but joined the R.N.A.S., and got his pilot's certificate on June 24th, 1916. He left England for active service the last day of the same year.

MILITARY.

G.H.Q. COMMUNIQUÉS.

MAY 1st, 8.45 p.m.—Marked activity in the air continued yesterday and during the night. In air fighting eight German machines were brought down by our aeroplanes, two of which fell in our lines, and nine others were driven down out of control. Another hostile machine was shot down by gunfire.

Nine of our aeroplanes are missing.

MAY 2nd, 8.29 p.m.—Many fights took place in the air again yesterday, and 10 German aeroplanes were brought down, one of which fell in our lines. Six other hostile machines were driven down out of control by our aeroplanes, and a seventh was shot down in our lines by gun-fire.

Four of our machines are missing.

MAY 3rd, 10.30 p.m.—Great activity in the air continues.

Four German aeroplanes were brought down yesterday in air fighting, and another hostile machine was shot down in our lines. In addition, our aeroplanes drove down five other enemy machines out of control and destroyed four German kite balloons.

One of our machines is missing.

MAY 4th, 9.11 p.m.—A number of successful bombing raids were carried out by our aeroplanes yesterday, resulting in severe fighting in the air.

Three hostile machines were brought down by our aeroplanes, and five others were driven down out of control. Two other German machines were shot down by fire from the ground, and another was compelled to land behind our lines.

Two of our aeroplanes are missing.

MAY 5th, 8.40 p.m.—Yesterday fighting in the air again resulted in our favour. Five German machines were brought down by our aeroplanes and four others were driven down out of control. In addition, one enemy machine was shot down by our anti-aircraft guns. Two of our aeroplanes are missing.

MAY 6th, 9.15 p.m.—An encounter took place in the air yesterday between six British aeroplanes and from 15 to 20 German machines, attacking in different parties. The enemy succeeded in breaking up our formation, but our machines continued to support each other and brought down one German aeroplane just inside our lines. Two other enemy machines were brought down and seen to crash behind the enemy's lines. In addition, two more enemy machines were driven down out of control; the remainder of the enemy broke off the engagement. All six of our aeroplanes returned safely, though much shot about.

In all, four German machines were brought down by our aeroplanes yesterday, and five others were driven down out of control. Another two enemy machines were shot down by our anti-aircraft guns.

Two of our machines are missing.

MAY 7th, 8.30 p.m.—Successful work was done by our aeroplanes yesterday in spite of a strong wind.

Six German aeroplanes were brought down, one of which fell within our lines. One other enemy machine was driven down out of control.

Three of our machines are missing.

WAR OFFICE COMMUNIQUÉ.

The G.O.C. British Forces in Macedonia reports:—

MAY 2nd.—On our Doiran front an enemy aeroplane was shot down and fell in our lines.

HOME FORCES COMMUNIQUÉ.

MAY 7th, 12.40 p.m.—In the early hours of this morning a hostile aeroplane appeared over the outskirts of North-East London, and dropped four bombs.

One man was killed, and a man and woman injured.

Slight damage was done to buildings.

THE CASUALTY LIST.

Reported May 2nd.

KILLED.—Barne, Capt. S., M.C., Hussars, att'd. R.F.C.

Crow, Sec. Lt. C. M., R.F.C.

Greg, Capt. A. T., Cheshire Regt., att'd. R.F.C.

Reynell, Sec. Lt. F. H., R.F.C.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED, NOW REPORTED KILLED.—Black, Maj. M. A., Dragoon Guards, att'd. R.F.C.

WOUNDED.—Coote, Lt. M. H., R.F.A., att'd. R.F.C.

Elderton, Capt. E. F., R.F.C.

Fairbairn, Sec. Lt. G. G., Yeomanry and R.F.C.

Goody, Lt. H. E., R.F.C.

Oliver, Sec. Lt. F. L., Somerset L.I., att'd. R.F.C.

Reed, Lt. W. E., R.E. and R.F.C.

Rothwell, Sec. Lt. J., Manchester Regt. and R.F.C.

Taylor, Sec. Lt. A. D., R.F.C.

Turner, Sec. Lt. E. T., A.S.C., att'd. R.F.C.

Watts, Sec. Lt. W. P. T., R.F.C.

Yonge, Sec. Lt. N. C., S. Wales Bordrs., att'd. R.F.C.

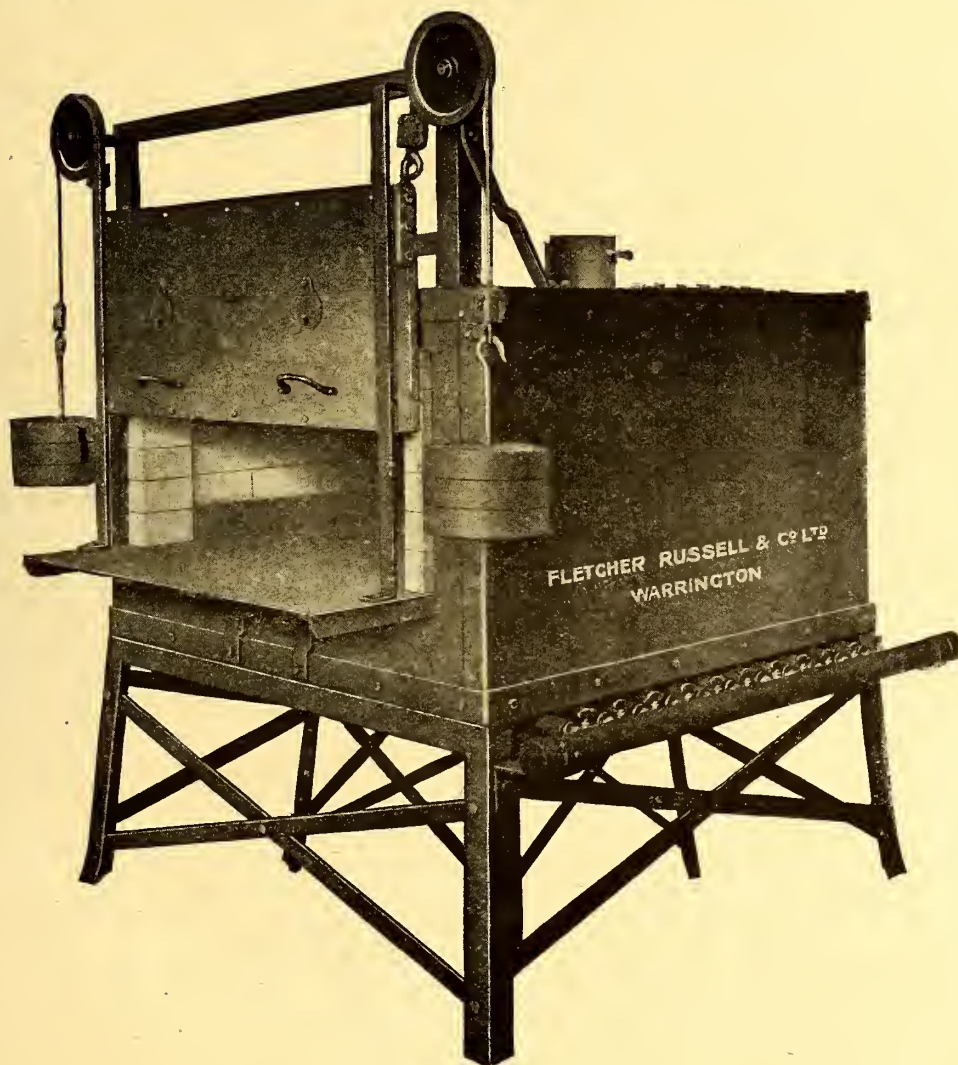
Zink, Sec. Lt. E. L., R.F.C.

MISSING.—Carter, Sec. Lt. F. L., E. Surrey Regt., att'd. R.F.C.

Furniss, Sec. Lt. K. R., Yeomanry and R.F.C.

(Continued on page 1212).

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The British Aircraft Industry.

BY CHARLES L. FREESTON.

(Founder Member of the Royal Aero Club.)

XV.—THE NORMAN THOMPSON FLIGHT CO., LTD.

Various are the reasons that have been given me from time to time by pioneers of the British aircraft industry as to the genesis of their interest in the science of flight. With some it was the achievements of the Wright brothers, either at Dayton or after they arrived in Europe, which supplied the initial stimulus; with others, the birth of their aviation enthusiasm dates from Louis Blériot's cross-channel flight; and in one case the incentive was ascribed to M. Santos Dumont's experiments with "heavier-than-air" machines.

A NEW NOTE.

Mr. Norman A. Thompson, however, struck a new note entirely, for he took up aviation on purely academic grounds. Educated at Harrow and Trinity College, Cambridge, he served two years with the General Electric Co. in the United States and was then for a time with the Allgemeine Electricitäts Gesellschaft in Berlin, after which he became manager of the Glyde Valley Electrical Power Co. The change from electrical engineering to aircraft designing came about in this way. He had a standing order with his bookseller to keep him supplied with the latest technical works, and in due course there came along Mr. F. W. Lanchester's well-known volume on "Aerodynamics." The effect of this book on Mr. Norman Thompson was to convince him that the subject of flight had emerged from the laboratory stage and was now a matter for the engineer.

Then, in Sept., 1908, Mr. Lanchester's second volume appeared, and this served to deepen the impressions of the first.

Mr. Thompson made the acquaintance of Mr. Lanchester soon afterwards, and in March, 1909, they entered upon a friendly collaboration as designers.

AN EARLY LANCHESTER DESIGN.

Mr. Thompson then decided to throw up electrical work, and started the firm of White and Thompson, as aeronautical engineers. Dr. White was an old friend, a man of varied interests, and was the chief financier of the undertaking.

In the first instance the constructional work was entrusted to the Daimler Motor Co., of Coventry, and a beginning was made with a chassis fitted with a pair of 50-h.p. Gnome engines. In the summer of 1910, however, Messrs. White and Thompson set up

works of their own at Bognor, and there completed the chassis which had been begun at the Daimler works.

SMALL SCREWS.

It was an all-steel machine, of pusher biplane form, with aluminium wings and a four-wheel chassis, and was designed by Mr. Lanchester. The planes were very small, the span being only about 30 ft., and the main idea of the new firm was to go in for high speed. As a matter of fact, however, the machine was never really got off the ground until a lot of surface was added, the chief reason being that at that period Mr. Lanchester believed in small propellers.

Those fitted only measured 5 ft. 2 ins., and with the engines named there was never sufficient thrust to raise the machine from the ground. The pilot, by the way, was Captain Wilmot Nicholson, R.N., who went down with the "Hogue," but came up again.

Experiments with this machine kept the firm busy for some time, but it had, in point of fact, "too much brains" about it for an initial effort. Among other details of too refined a character it possessed a pneumatic landing gear. Gradually, however, Mr. Norman Thompson changed one thing after another, and eventually the machine was persuaded to leave the ground—or rather the beach at Bognor, where there is a very fine foreshore at low tide with tremendous runs and soft sand to alight on.

THE FIRST SUCCESS.

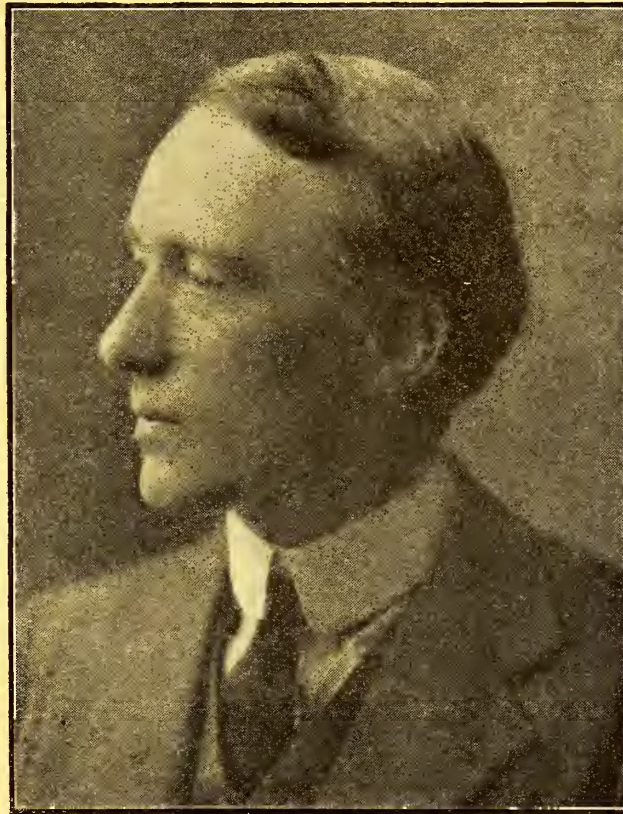
Mr. Norman Thompson then brought out a pusher machine of his own design, with an all-steel chassis and fitted with an A.B.C. motor of 120-h.p. This second effort was more successful, and the machine got off the ground very well and proved fairly fast. It was flown in the first instance by Flt. Lt. E. R. Whitehouse, R.N., and Lt. R. L.

Charteris, R.F.C., but later on, after the Deperdussin failure, the firm secured the services as pilot, in the autumn of 1913, of Lieut. (now Wing Commander) Porte, R.N.

Early in 1914, he tipped the machine up, and Mr. Thompson decided that it was not worth while rebuilding it. The firm had just begun, in fact, to concentrate on the Curtiss flying boat, of which he had secured the exclusive rights in this country.

THE FIRST BRITISH FLYING BOAT.

The next step was to bring out a flying boat of the firm's



Mr. Norman Thompson.

own design, with the intention of competing in the "Round Britain" race. The hull was of the well-known sewn type, by Saunders, of Cowes, and measured 24 ft. Mr. Thompson was fortunately able to obtain the loan of a 120-h.p. Austro-Daimler engine. He used the R.A.F. 6 section in the design of the wings, and fitted a negative tail with a high aspect ratio; it was also torsionally stiff round the boat.

A STABILISING FIN.

There was no dihedral, but he used a single stabilising vertical fin. The mechanical work of the machine generally was the special charge of Mr. Thompson himself, and was particularly well carried out.

The new flying boat proved very successful in every way from the first. She did about 85 miles an hour, left the water within a few yards, and was perfectly stable, and when she was tested only five days before the war broke out it was not found necessary to alter a line of her, nor has any material modification been subsequently required.

THE FIRST TWIN-ENGINE BOAT.

She was quite ready for the "Round Britain" race, and a second machine which was also being built at the same time was nearly ready. This was fitted with two Curtiss engines. The Norman Thompson Flight Co., it may be mentioned, not only claim to have given the flying boat to the Navy, but also to have been the first to fit that type of craft with twin engines.

A BOAT-BUILDER'S FUSELAGE.

Of course the war prevented the "Round Britain" race being

THE JOY STICK.

The house magazine of A. V. Roe and Co., Ltd., of Manchester and elsewhere, appears with unfailing regularity despite the difficult conditions under which such an institution exists in these days. An addition to the journal, which will be welcomed, is a special section for the apprentices of the firm, and the writer gives some straight talk to this section of the industrial community.

Mr. George Webster, the Editor, who seems to be principal artist, leader-writer, poet and fiction constructor all in one, has perpetrated a somewhat grim cartoon showing a totally enclosed Avro biplane converted into a flying prison-van. One is somewhat surprised to see that the convicts have been accorded a free view of the surrounding landscape, because the old time

held, but the flying boat with the 120-h.p. Austro-Daimler engine was acquired by the Admiralty, and orders were placed for other machines of the same type. Mr. F. P. H. Beadle then joined the firm as designer, and brought out a novelty in the shape of a land machine with a boat-builder's streamline body instead of the ordinary fuselage.

This proved very successful, and it is a matter of surprise to Mr. Norman Thompson that no one has ever taken up the idea of using a boat body for a land machine. He contends that it possesses advantages in the way of extra speed in respect of its streamline formation and affords much more protection to the pilot in the event of a crash, while the amount of additional weight involved is inappreciable. Mr. Clifford B. Prodder, by the way, was one of the pilots who flew the machine in question, and thought extremely well of her; incidentally he looped the loop on her.

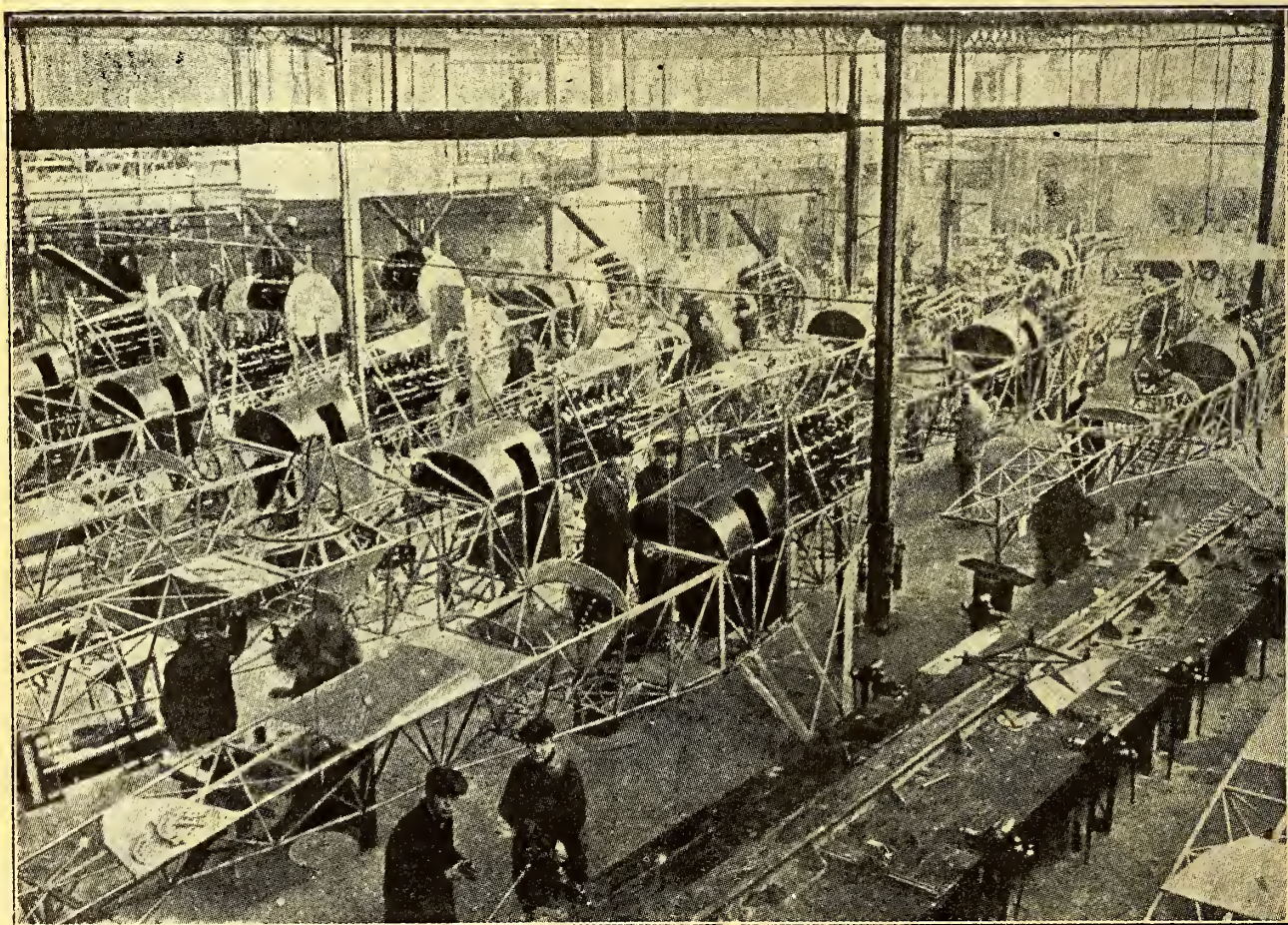
AT WORK FOR THE ADMIRALTY.

During last year the style of the firm was changed from White and Thompson to the Norman Thompson Flight Co., Ltd. They have for a long time past been engaged in the building of seaplanes exclusively for the Admiralty, and, as in every other case of war-time developments, the works have been enlarged as the result of war-time demands. Reference, of course, is impermissible to current models, but at least it may be said that they are not only highly interesting in themselves, but characterised by particular soundness in respect of workmanship and detail, for which Mr. Thompson gives every credit to Mr. N. M. Hiskins, his works' manager.

"Black Maria" was apparently designed to prevent them seeing anything at all.

The institution of such a penal locomotive would constitute something in the nature of a national peril, because in these days the average individual, especially the average lady, is prepared to propitiate an aviator in most ways if there is the slightest hope of attaining a joy ride, and one dreads to contemplate the effect of an aerial prison-van, even if cross-country flight can be obtained in exchange for a few months' "time" secured by a little mild burglary or, let us say, window breaking.

The Editor notes that Messrs. Thompson Bros. and John Burtonshaw, who have business relations with A. V. Roe and Co., Ltd., have adopted the "Joy Stick" as their house magazine, the size of their own establishments not warranting a separate publication.



IN A FRENCH AEROPLANE FACTORY.—The photograph above, which was published in America, shows the activity prevailing in an aeroplane factory near Paris. The steel tube fuselages, tapering, German fashion, to a T-shaped stern, are interesting.

Reproduced from "Aviation," New York.

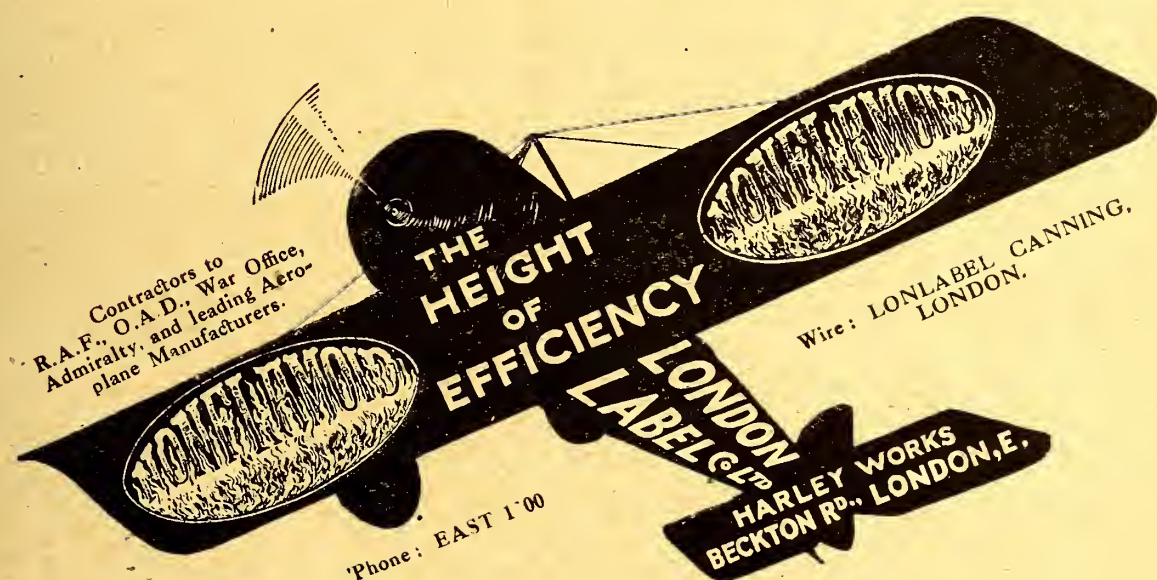
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SEAPLANE FLOAT FORMS.

BY CHARLES G. MACGREGOR.

(From "Aviation," New York, March 15th, 1917).

The float of a seaplane is that part of the machine which enables it to float on, rise from and alight on the water. It performs the same functions on the seaplane as the landing gear on the land machine, and is virtually a small boat divided into water-tight compartments, connected to the machine proper by steel or wood struts and wire stays of sufficient length to give good clearance for the propeller from the hull and the water. It is necessarily built very light and strong enough to withstand the enormous impacts to which it is subjected; it is of such a form as best suits its peculiar duties when on the water, at the same time offering as little head resistance as possible when the machine is in flight. The seaplane when on duty must be able to put to sea in anything but lifeboat weather. It may have to run out of the harbour in the face of a strong breeze and a heavy sea, or be launched from the mother ship either by being hoisted over the lee side by a derrick or by being projected from the deck of the ship by means of a launching catapult, or it may be carried out to sea on the back of a submarine, which acts as a floating dock by submerging when launching the seaplane into the water, and emerging from under when taking it out on its back.

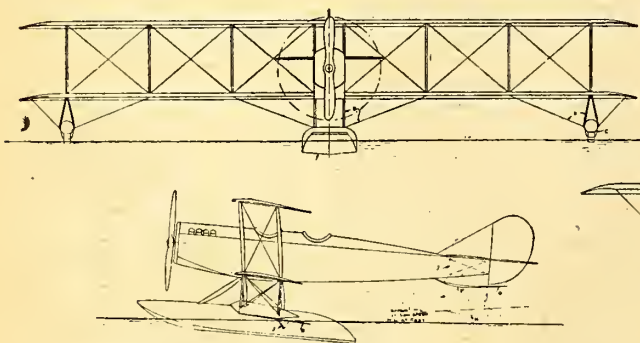


FIG. I.

On getting under way in a seaway, the float is often completely submerged in solid water; then, again, it will nose into the waves as the seaplane gathers speed. On reaching planing speed (which is from about 20 miles per hour and up, until the machine attains the maximum or "getting off" speed), the seaplane will often jump clear out of the water, but, not having gained enough speed to sustain it in flight, it stalls and flops in again, sometimes flat on the bottom or flat on the tail of the float, or even at a most dangerous angle. This hopping, as it is called, may be repeated over and over again until sufficient speed has been gained to enable the machine to jump from a wave crest and continue its flight in the air. On alighting, the buffeting is no less severe and, when flying with a cross wind, the danger is increased, as the machine will skid unless the float should be of such a form as to minimise this.

Where two floats are used instead of the single one, the whole landing gear is subjected to most severe straining, as when the bow of the one float is under water, bearing almost the whole weight of the machine, the tail of the other float may be completely out of the water or supported by another wave, thereby putting the whole of struts, wire gear and floats under very severe twisting, straining and tension. It is here that great rigidity or extreme flexibility, in the form of shock absorbers, is a commendable feature in the float attachments.

It will thus be seen that the seaplane is no fair-weather machine, and that the float, apart from its high speed and planing qualifications, performs a more important function than is generally appreciated.

DESIGN.

In determining the size of the float when it is being designed, several important points must be considered. The float supports the weight of the whole machine, and should have an excess buoyancy of from 70 to 150 per cent. of the weight of the com-

plete seaplane in its loaded condition. This reserve buoyancy enables the machine to recover quickly when the float is submerged in a seaway. When running on the surface there is always a possibility of the float being damaged, such as having the sides or bottom pierced by shell fire or by striking a partially submerged log or driftwood; therefore, the interior is divided into independent water-tight compartments, usually about six in

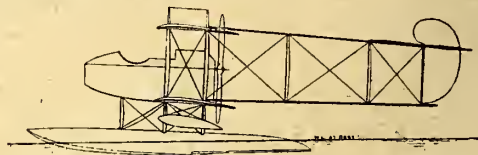


FIG. II

number, and arranged in such a manner as to ensure the machine against sinking or capsizing when any one compartment is flooded.

There are two distinct types of landing gear, the single float and the twin floats.

THE SINGLE FLOAT.

When Glenn H. Curtiss first experimented on Lake Keuka, N.Y., in 1910, he used on his machine a single float, which was an ordinary canoe (Fig. VI-A) lightly decked over. Since then the single float has been used extensively, and makes a very satisfactory and seaworthy outfit, provided the machine is of the

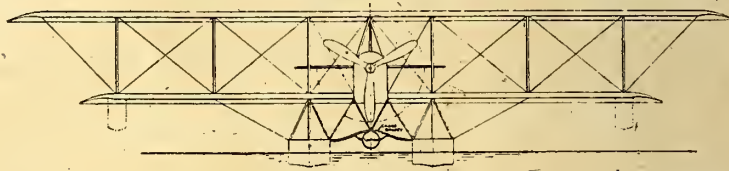


FIG. IV

single engine type (Fig. I.) There are few struts and wires, the air resistance is comparatively small, and in a seaway there is less racking and straining on the whole gear than is the case with the twin float landing gear.

The length and breadth dimensions of the float are important.

In a head sea the machine is subjected to a considerable amount of pitching and rolling. When, by the action of the waves, a boat oscillates in a longitudinal direction about a transverse axis, it is said to "pitch," and when it oscillates in a transverse direction about a longitudinal axis it is said to "roll." Rolling and pitching generally take place together in a seaway. "Heaving" is the vertical motion given to a boat by the waves. So it is imperative that the float should have sufficient longitudinal stability when pitching to prevent the machine falling back on its tail or forward on its nose, and have sufficient lateral stability to eliminate any undue amount of rolling over on the wing tips. There are instances where the main floats have been too short, lacking in stability, and the machines have fallen back on their tails, and finally turned right over on their backs. This can be prevented by the use of a small float fitted below the tail (Fig. I-F), or by fitting a water-tight tank inside, at the after end of the body (Fig. I-J). The bow of the float must have sufficient bearing surface to prevent the machine tipping over on its nose when alighting or getting under way. This tipping tendency can be minimised by keeping the centre of thrust of the propeller as low as practicable.

To prevent the wing tips dipping or being submerged when the machine is heeled over by a sudden gust of wind, small floats are attached to the extremities of the wings (Fig. I-C). These assist the main float in maintaining lateral stability. A flexible planing board or paddle is usually fitted to the underside of these floats (Fig. I-E), to absorb the shock if the float strikes water when running at high speed. The buoyancy of the float materially assists the machine to recover quickly to an even keel. These

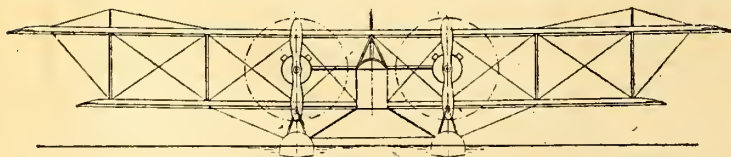


FIG. III



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wing and tail floats should be of sufficient buoyancy or volume to support the machine when inclined over on the wing to port or starboard, or back on the tail. They are fitted either close up to the main structure (Fig. VIII-C-D-E) or held sufficiently far below by means of struts and wires to keep them just clear of or touching the water when the machine is at rest (Fig. VIII-A-B).

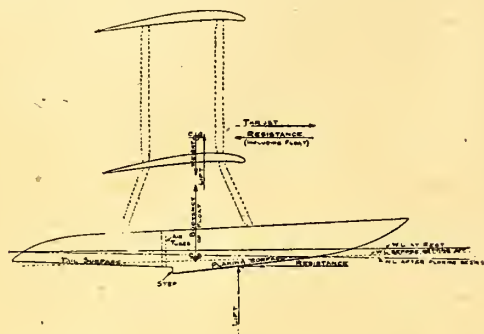


Fig. V

When a seaplane is running at low speed on the water, steering is very difficult because of the insufficiency of wind pressure on the rudder to keep the machine under control. This fault can be overcome to a certain degree by the use of water rudders. These can be arranged for either on the wing floats in the form of small horizontal flappers or drags fitted to operate below the planing boards (Figs. I-J and VIII-A), or by arranging the tail float so that it is partly submerged (Fig.

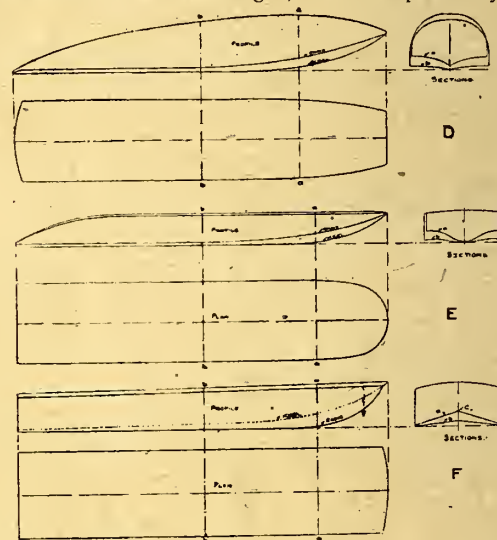
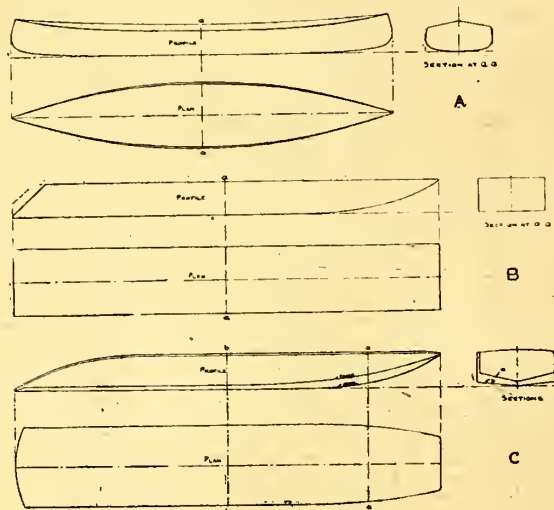


Fig. VI

I-H) when under way, and having it placed so that it can be turned to port or starboard with the air rudder; the water bears on the flat of the side. By this means it performs the duties of a float and a water rudder at the same time. Another method is by the use of a small water rudder. The air rudder post is extended down to a point below the water, supporting the after end of the float and a small metal rudder blade (Fig. VIII-F). This rudder is sometimes arranged to operate independent of the air rudder. If the main float is sufficiently long, the tail float can be dispensed with (Fig. II), but the wing floats should always be used with a single main float.

TWIN FLOATS.

For good all-round service, the twin-float landing gear (Fig. III) is very satisfactory. As already stated, the whole gear is subjected to most severe racking and straining, but apart from this it is a very stable, seaworthy and serviceable outfit. By the use of twin floats, the wing floats can be dispensed with, except in the case of some torpedo seaplanes where the floats are very close together (Fig. IV); but the tail float should be used where the main floats are short, as with the single short float (Fig. I). The main floats must not be spread too far apart, for, when one float is submerged more than the other, the machine has a strong tendency to spin around quickly, due to the increased resistance of the immersed float, the decreased resistance of the emerged float and the leverage between them.

For twin engine or twin body machines, they are particularly favourable in that each supports directly the weight of one engine or one body (Fig. III). This arrangement of floats is also most suitable where the machine is used as a torpedo-carrier or as a bomb-dropper. The torpedo is carried suspended from the cross braces between the floats and just

clear of the water (Fig. IV). When ready to be launched, the torpedo can be instantly released from the slings or brackets and dropped into the water; similarly the bombs have a clear drop from below the body.

HYDROPLANING.

Before describing the various float forms, it is necessary here to give a very brief and simple outline of the theory of hydroplaning, for clearer understanding of the principles involved in the designing of the bottom or planing surface of the seaplane float.

The principle of hydroplaning can be very clearly illustrated by taking a flat stone or slate and throwing it on to the water's surface at a flat angle, so that when it strikes the water on the flat of its under face, the impact will cause it to skim along the surface of the water, sometimes in a series of jumps for a number of yards, until it loses its momentum. This is almost exactly the behaviour of a float or hydroplane on reaching planing speed.

THE MULTISTEP FLOAT.

The multistep or Fabré type hydroplane has from two to seven steps built in on the bottom, transversely and one ahead of the other (Fig. VII-C). This type is not quite practicable on the seaplane float when more than two steps are used, as these oppose the rocking motion so necessary on the seaplane float. With so many breaks on the bottom the resistance in flight would be increased. The construction would be heavier and more costly than the others.

TOPSIDE FORMS.

The topsides, like the bottoms, are of various forms. The simplest is that with the flat sides and deck. Structurally, it is very simple, but the proportion of the weight to the strength is rather excessive. The efficiency of the flat deck, in freeing itself from water when submerged, can be improved by giving

it a camber or slight round transversely (Fig. VI-C). The tails of many of the earlier types were built almost square at the back (Fig. VI-B); they were not conducive to the reduction of resistance or weight, and were slightly heavier and weaker than those which curved down from the deck to the tail without a break (Fig. VI-C). Fig. VI-D shows a very efficient form of stepless float, where an attempt has been made to introduce the streamline form as much as possible without sacrificing the seaworthiness.

The present Navy type has some features worth noting, principally the V-bottom and the crowned or rounded topsides (Fig. VII-A). This form of topside allows of a stronger and lighter construction being used than that of the other types; it is a fairly good streamline form, and when the float is buried in a wave, it will throw the water off and allow the machine to recover quickly, a very important asset when travelling in a rough sea. With a flat top under these same conditions, it has a tendency to hold the water and make the machine act sluggishly.

WING AND TAIL FLOATS.

Reference having already been made to the uses of the auxiliary floats, we will now discuss their general design.

They are built of either wood or metal, wood being found to be more satisfactory than metal, except in the smaller sizes and cylindrical forms. This cylindrical form is shown in Fig. VIII-A, the ends are conical and the bottom is flat, against which the planing board is fitted. This was one of the earliest types used and has been very satisfactory. It is suspended below the tail or wing by struts, so that it is just clear of the water with the planing board touching when the machine is at rest. In the larger size and V-bottom floats, the planing boards are dispensed with almost entirely.

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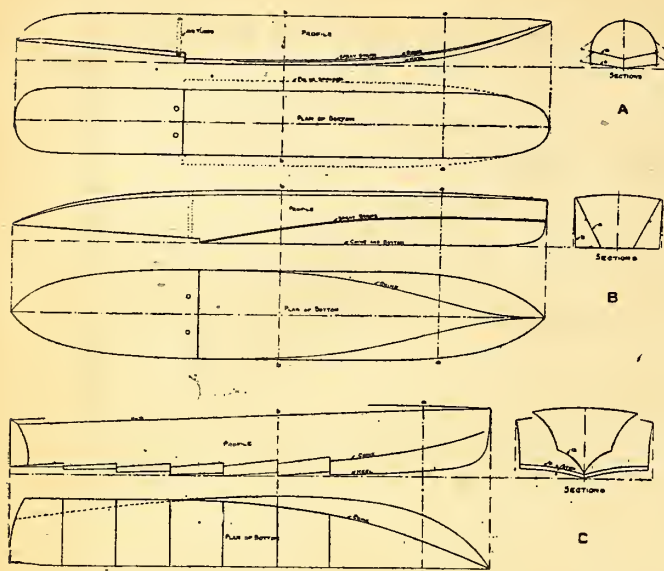


FIG. VII

Fig. VIII-B is of a simple streamline form suspended close to the surface of the water. C is one of the larger type, fitted close up to the wings or tail. It is of the concave V-bottom class and very efficient. D is another of the earlier forms of metal floats, fitted with planing board and flat or slightly V-bottom. These are so narrow and deep that a brace is necessary from the bottom to the wing beam. E is a similar type to C except that it is made to the same form of the body on top, with a straight V-bottom. Instead of having a planing board attached to the bottom, an ash skid is fitted to protect the rudder. F (previously referred to) is similar to B except that the sternpost is vertical instead of horizontal, so that the water will have a clear run to the water rudder which is swung at the back.

The interior of each of these floats is divided into two or more water-tight compartments, similar to the larger floats, by cross bulkheads; which also help to stiffen the floats transversely.

Fig. V shows diagrammatically the various forces acting on a seaplane when running on the water. With the forward motion of the float given by the thrust of the propeller, the pressure of the water on the planing surface, which is inclined at an angle varying from 2 deg. to 5 deg. when running, supplies an upward acting component which lifts the float nearer to the surface as the speed increases. As the speed increases the displacement decreases, both by the increase of the lift on the planing surface and the lift proper of the wings. When running at low speed before planing starts, there is a great deal of resistance due to wave and eddy making, which diminishes rapidly as the higher planing speeds are attained and when the lift of the wings becomes effective. A break is made in the streamline of the bottom so that the machine can get off the water easily. This is accomplished by the introduction of a transverse "jog" or step on the planing surface, varying in depth from $1\frac{1}{2}$ to 5 inches (Fig. V). To relieve the bottom at the back of the step from any suction or eddies, air is allowed access to this part through tubes, usually led down from the deck to the bottom abaft the step. These air tubes are not essential where there is a very pronounced "V" on the bottom, or where there is plenty of reserve power.

FLOAT FORMS.

The floats now in general use are of various forms on the topside, bottom and planing surface. These can be classified as follows:—

1. The stepless float.
2. The step float.
3. The multi-step float.

The topside form is not governed by the bottom form, so that any of those shown in Fig. VI can be combined with any other type.

THE STEPLESS FLOAT.

In the stepless float there is no break in the bottom, so that it forms the entire planing surface. The tail end takes the place of the step, therefore the float must leave the water at this part. This form of bottom is practicable on the short floats only, of lengths up to 15 feet, because the break or step should be kept not far from a point directly below the centre of gravity of the machine; the farther it is from the centre of gravity the more difficult it becomes to get the machine off the water.

Fig. VI shows in outline some of the commoner types of stepless floats. B is a simple form from a building standpoint, and runs well in calm water, but, owing to the flatness of the bottom, the structure is apt to be strained by the severe impacts with the water; nor does this flatness help to prevent

skidding. C is not quite so simple structurally as B, but is a much better form to withstand impacts. Being V-shaped, it cuts into the water more or less, and thereby relieves the strain on the bottom structure. It is comparatively simple to build, prevents skidding or side-slipping to a great extent, and is an altogether satisfactory form for general uses.

D has all the qualifications of B, with the exception that it is more difficult to maintain the concave bottom form when building; this concavity is increased at the forefoot or in the bow sections, and materially helps to reduce the pounding of the waves on the planking. E is not used much on floats on account of its width not being sufficient to get the full benefit of this type of bottom, which is known as the "Wave-collecting" form, and is adopted mainly in motor-boat design and sometimes in flying-boats.

F is the "Viper Sea Sled" type of hull, and has been very successful and seaworthy for the ordinary seagoing launch, but it has not been developed in seaplane float design on account of its unusual form, the inverted V, which makes the introduction of the step on the planing surface a very unsatisfactory proposition; without the step the machine would require a large amount of reserve power to get off the water. Great transverse strength is required in the bottom structure to resist the outward pressure of the water on the bottom, tending to split it at "c"; this necessitates the carrying of more weight than is required for the ordinary V-bottom, so that this is detrimental to its adoption on the seaplane float. It is, however, very easy in a seaway, and very high speeds have been attained by its use.

THE SINGLE STEP FLOAT.

The qualifications of the planing surfaces of the stepless floats apply equally to the single step float. This type is the one most commonly used. Having only one step, air resistance is minimised, and by placing this in proper relation to the centre of gravity, the machine will balance well when planing. The best position for the step is roughly from about 6 to 36 inches abaft the centre of gravity of the machine. Should the step be placed ahead of this point, the machine will be inclined to porpoise, thereby rendering it liable to the smashing of a wing by excessive rolling, or tipping over on the nose and capsizing.

When running at high speed, the straight V-bottom throws a thin sheet of water and spray out on each side, which are caught by the propeller or propellers, thereby drenching the machine. To prevent this, spray strips are attached to the chines or outer edges of the planing surface (Fig. VII-A), which deflect the water downward. Fig. VII-B illustrates a type of float used extensively in Europe but not adopted in this country. The design is the outcome of extensive tank model experiments made in England (see "British Report," 1912-1913).

The design is peculiar in that it shows a flat bottom, flaring bows, and rather a fine entrance; it depends on its length for longitudinal stability. The bearing surface of the bow increases very rapidly as the bow is depressed, on account of the flaring sides. When being towed in the tank, the model threw a thin sheet of water out on each side, close to the sides; this was deflected by fitting the spray strip along each side.

In the single step float the tail surface does not act as a planing surface, therefore it should rise from the step to the stern at an angle from 3 deg. to 6 deg., so that there will be no opportunity of causing a suction action when the machine is running on the step and about to get off the water. This sur-

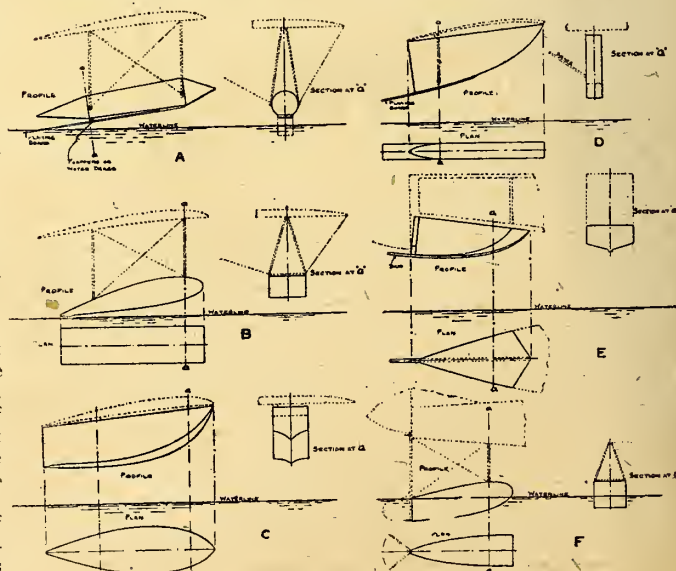


FIG. VIII



ARMSTRONG, WHITWORTH

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face is usually flat or V-form, the latter being preferable, for when the float strikes the water with the tail, the V-form relieves the shock.

On reaching the higher speeds just before leaving the water, it is possible, with the single step, to rock the machine about this point by means of the controls, in order to get a flatter angle of planing surface, and adjust the wings nearer to the angle of incidence necessary for flight. This manoeuvre is rendered difficult where more than one step is used on the bottom, as these tend to oppose the rocking motion.

Several tests have been made with attached planes, in the nature of plates fitted to the bottom with struts. With the bracing necessary for their attachment to the hull, they add a considerable weight to the machine besides the float weight, and at this point of attachment the force of the weight of the whole machine is concentrated, then, with the jumping action of the seaplane when planing, this force is enormously increased; then, again, they are most awkward when handling or stowing the machine either on shore or aboard ship.

Sometimes more planing surface is required on a single step afloat without increasing the volume or dimensions of the body of the float. This can be obtained by extending the planing surface out on each side, from 5 to 10 inches, according to the additional amount required, the outer edge curving in at the fore-end. This extends from the step forward to within about 24 inches from the stem on each side. Additional buoyancy can be obtained, without adding much to the weight, by planking over the braces from the edge of the planing surface to the hull side, thus making two water-tight compartments called fins or sponsons (Fig. VII-A).

THE AMERICAN AIRCRAFT INDUSTRY.

The U.S. Navy Department announced on March 12th purchase of 16 non-rigid airships, in accordance with bids which were opened on March 6th to specifications which were published in "Aviation and Aeronautical Engineering" of March 1st.

The Curtiss Aeroplane Co. was awarded contracts for three "Blimps" at 40,750 dols. each.

The Connecticut Aircraft Co., two at 42,000 dols. each.

The Goodyear Tyre and Rubber Co., nine at 40,000 dols. each.

The B. F. Goodrich Co., two at 41,500 dols. each. According to the contracts deliveries are to begin within 120 days.

The machines are to operate from shore bases, but to be able to rest on water in good weather. The gas bags will be 160 by 31 ft. Each airship will carry two men, and will be equipped for radio communication. They will have 100 h.p. engines, a safe altitude limit of 7,500 ft. and at 600 ft. a maximum speed of 45 m.p.h. for ten hours. At 35 miles an hour they will carry fuel for 16 hours running.

Frank H. Trego has purchased the factory buildings of the A. C. Gilbert Co. at Fox and Ferry Streets, New Haven, Conn. The Trego Motors Corporation was formed in April with a capital of 1,500,000 dols., to build engines, aeroplanes and flying apparatus.

Reports recently received in America from England indicate that the new Sperry searchlight has been one of the chief factors that have rendered Zeppelin raids on London abortive. It is said that the new carbons used in these lamps to increase their intensity have been among the most important factors in frustrating the Zeppelin raids.

This lamp has been used recently for experimental work on the aviation field at Mineola. It illuminates a target ten times as brilliantly as an ordinary projector, and its arc is as bright as sunlight.

The brilliancy of this lamp is due, among other things, to the special carbons. The arc burns at a temperature of 10,000 degrees Fahr. The candle-power of the 60-in. Sperry searchlight exceeds 1,250,000,000.

An important feature of this searchlight is the remote control, which is very desirable for anti-aircraft work. By means of this apparatus the lamp can be operated, even upwards at an angle of 90 degrees, from a distance as great as one mile.

This lamp can be used for other purposes, such as coast defence work, for which its long range makes it specially suited. The 60-in. Sperry searchlight has been seen 150 miles away. The lamp can also be used for signalling and is installed on naval vessels.

The installation of these new searchlights, together with the use of incendiary bullets for machine-guns, is said to have resulted in the stopping of Zeppelin raids on London.

Searchlights stationed at coast towns pick up the Zeppelins and permit the heavier than air machines to destroy them.

Henri Julliot, the famous French builder of airships, is in America supervising the erection of the airships which the Government is having built by the B. F. Goodrich Co. He built the big airships, "Le Jaune," "Lebaudy," "La République," "La Liberté," and "La Patrie." His first military air-

ship was built in 1902 before Count von Zeppelin had made his first balloon.

"The United States will need many airships in hostilities with Germany," M. Julliot declared. "They are essential for coast defence. The larger airships can go out to sea for 500 miles and watch for enemy fleets."

Because they can stand still in mid-air and because they can carry 6,000 to 8,000 lbs. of explosives in addition to their own weight, they will play a big part in naval offensive operations.

"To become an operator of a military airship one must have youth, a few months' training and a working knowledge of physics and mechanics."

M. Julliot will spend two or three years in America, designing and supervising the construction of military airships.

The Christofferson Aircraft Manufacturing Co.'s plant at Redwood City, Cal., which has been closed since the death of Silas Christofferson a few months ago, is about to re-open, according to newspaper reports from the Pacific Coast.

At a meeting attended by representatives of San Francisco capital, Lansing Tevis, president of the Christofferson Aircraft Manufacturing Co., and E. T. McGettigan, manager of the Redwood City Chamber of Commerce, plans were adopted for reopening the plant upon an enlarged scale. A representative of the San Francisco capitalists is reported as having said: "The Christofferson plant will soon be running full blast and its output will be more than planes and engines. The plans of the people that I represent do not permit of my giving out names at present, but it is sufficient that they have the necessary capital, and they gave me instructions to go ahead and arrange with Mr. Tevis for the refinancing of the engine and airship corporations. The plant will not only be utilised as an up-to-date engine and aeroplane factory, but also for carrying out other far-reaching manufacturing plans."

The Duesenberg Motors Corporation has succeeded the Duesenberg Motor Co., St. Paul, and the Loew-Victor Engine Co., Chicago, its capital being 1,500,000 dols., of which 1,050,000 dols. is paid in. The company has located a plant in the east at Edgewater, N.J.

The engineering and experimental forces have already moved from Chicago and the company will, in a short time, be building on a commercial basis a line of Duesenberg engines for both automobiles and aeronautical purposes, devoting the output of the Chicago plant to marine models.

The Loew-Victor Engine Co. has been building one of the largest high-speed marine gas engines on the market for the past year. These motors were designed by F. S. Duesenberg.

The Chicago plant will, in the near future, be consolidated with the Edgewater plant. The sales and executive offices of the company will be at 120, Broadway, New York.

The personnel of the organisation is as follows: Directors, J. R. Harbeck, F. S. Wheeler, Charles Stollberg, K. S. Breckenridge, L. A. Welles and F. B. Page. The first five are all of one of America's largest industrial corporations. Mr. Page is vice-president and general manager of the E. W. Bliss Corporation.

J. R. Harbeck, who was president of the Loew-Victor Engine Co. since its formation, is president and managing director of the Duesenberg Corporation. E. L. Decker is assistant to the president, H. A. Wing is secretary and treasurer, C. B. Page is general manager in charge of production and N. G. Rose is general sales manager. F. S. Duesenberg is chief engineer. A. S. Duesenberg is assistant engineer. M. M. Whitaker is assistant engineer and navtl architect. G. A. Beilstein is purchasing agent and F. E. Lampe is superintendent.

COMMERCIAL AERONAUTICS.

A very important lecture is to take place at the Royal Society of Arts on Wednesday next, May 16th, when Mr. Louis Coatalen, of the Sunbeam Co., is to read a paper on Aero-Engines. Mr. Dugald Clerk will be in the chair.

Mr. W. Barnard Faraday, the Secretary of the Aeronautical Society, announces that applications for tickets for Mr. Holt Thomas' lecture on Commercial Aeronautics on May 30th have been so numerous that the Aeronautical Society has taken the Central Hall at Westminster for the purpose of seating the expected audience. This hall holds 2,700 people, and if the readers of THE AEROPLANE are anything like as intelligent as the bulk of their correspondence suggests, even this hall should be too small.

The lecture should be of interest not only to everybody concerned with the production of aircraft, but also to the Services, because it is probable that quite a number of officers, both pilots and penguins, will think more highly of making money out of the commercial side of aviation after the war than of remaining in the Services. Therefore, everybody who hopes ultimately to make a living out of commercial aeronautics should make a point of hearing Mr. Holt Thomas' views on a subject which he is so well qualified to discuss.

Tickets for both lectures may be obtained from Mr. Faraday at 7, Albemarle Street, W.1.

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HAMMERSMITH, LONDON, W.

THE PATENTS INDEX.

The subjoined index of recent inventions has been specially compiled by THE AEROPLANE from the current Official Patent Records.

PATENT APPLICATIONS.

- Astoux, J. J. and another. Aeroplane fuselages. No. 5994. April 27th.
 Astoux, J. J., and another. Wing systems for aeroplanes. No. 5995. April 27th.
 Cadett, J. W. T. Means for supplying internal combustion aero-engines with air. No. 6049. April 28th.
 Gledhill, A. H. Apparatus for releasing bodies from aircraft. No. 5786. April 25th.
 Goatly, F., and another. Landing runners for aircraft. No. 6042. April 28th.
 Kelly, F. D. Struts or supports for aeroplanes, etc. No. 5687. April 23rd.
 Mitchell, J. N. Aeroplane propellers. No. 6044. April 28th.
 Stark, A. H. Arrangement and construction of aerial propellers for driving dynamos, etc., on aircraft. No. 5873. April 26th.

COMPLETE SPECIFICATIONS ACCEPTED, PRINTED COPIES OF WHICH ARE OBTAINABLE ON AND AFTER MAY 17TH, 1917.

- 105,581. March 17th, 1916. Landor, A. H. S. Airships.
 105,588. April 12th, 1916. Kapferer, H., and another. Dirigible balloons.
 105,667. June 13th, 1916. Beston, G. Flying machines or airships.

RECENT ABRIDGMENTS OF PUBLISHED SPECIFICATIONS.

- 103,918. Aeronautics. HINKLER, B.

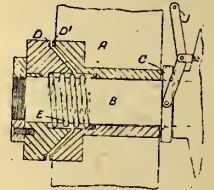
STEERING AND BALANCING.—Duplicate control gear for aeroplanes, etc., is provided with a special construction of clutch device for rendering either control inoperative. Two control

wheels 3, 8, Fig. 1, are connected by cables 4, 9 to levers 5, 10 for controlling the warping, and are mounted on pillars 1, 6 hinged at 2, 7 and connected by rods 11, 12 to levers 13, 14, Figs. 1 and 3, for controlling the elevators. Figs. 3 and 4 show the clutch device for the levers 13, 14, but a similar clutch 30, Fig. 1, is provided for the levers 5, 10. The levers 13, 14 are loosely mounted on a sleeve 15 and fitted with pins 16, 17, which work in slots in the sleeve and also enter a slot 22 formed in a tube 21 rotatable within, but movable axially within, the sleeve. The ends 23 of the slot 22 are widened out, so that when the tube 21 is moved to either of its extreme positions, one or other of the levers 13, 14 is inoperative, whereas, in the mid-position of the tube, both levers are operative to rotate the sleeve 15, which is fitted with levers 20 connected to the elevators. The tube 21 is actuated by Bowden wires, etc., 26, connected to a switch lever, 29, Fig. 1. In the example shown in Fig. 1, the Bowden wires 26 for the clutches of the elevator and warping controls are connected in series to the switch 29, so as to be operated simultaneously. In a modified form of clutch, the sliding tube is arranged externally of the sleeve.

CONTROLLING MOTIVE POWER, GEAR FOR.—Another set of Bowden wires, etc., 26 may be connected to the switch 29 and to another clutch device operating, for example, on the engine controls.

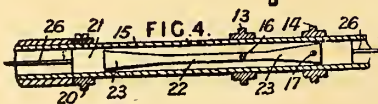
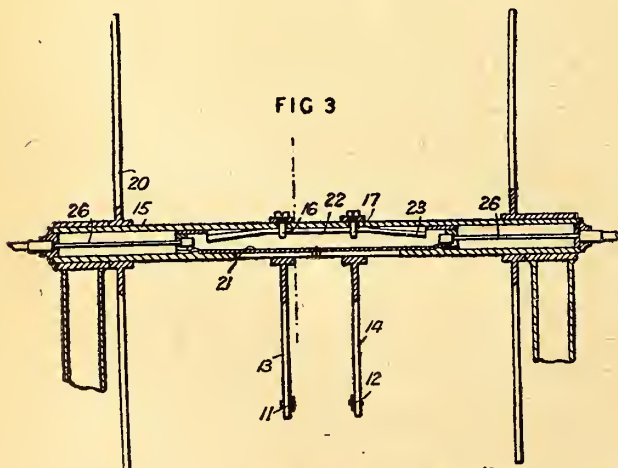
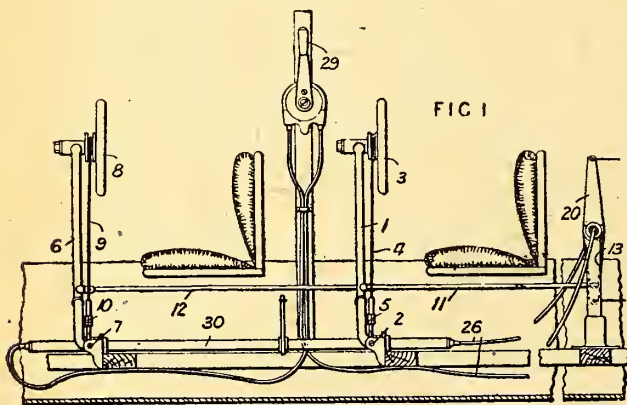
- 103,923. Clutches for Aeroplane Propellers, etc. DANIEL, M.

Clutch parts D, D', turning with the driving-shaft B and propeller A of an aeroplane or the like, are normally disengaged by a spring E, but may be engaged by a lever J and thrust-ring C bearing on the propeller. At high speed, the propeller thrust keeps the clutch parts in engagement, so that the lever J may be released, the clutch being automatically disengaged when the propeller speed falls below a predetermined limit.



- 104,050. Aeronautics. SMITH R. T., and RAWINGS, J. J. and SMITH, R. T.

STEERING; ALIGHTING INDICATORS.—Relates to means for automatically operating the elevators of a flying machine when landing, by means of a lever depending from the machine and adapted to contact with the ground or water. The control lever 2 operates the warping-lines attached at 5, by swinging transversely on a pin 4 connecting the lever to a boss 12, which is secured on a shaft 1 connected to the elevators and operated by swinging the lever longitudinally. The automatic device comprises a lever 25, Fig. N, pivoted at 22 under the machine and connected to a lever 9, which is adjusted to a sleeve 6, Figs. B and E, mounted to rotate on the boss 12 and secured to a cam 7. A second cam 8 is fixed on the machine, and a lever 15, carrying two rollers 16 engaging the cams 7, 8, is mounted on a shaft 14 carried by lugs 13 on the boss 12. The shaft 14 is controlled by a torsion spring and connected by an arm 19, Fig. A, to a rod 20 sliding through the control lever and formed at its upper end with a push-button adapted to project from the top of the control lever. A pawl-controlled winch, 27, Fig. N, is provided for lifting the lever 25 into its inoperative position, as shown in dotted lines. When the lever 25 is in this position, the lever 15 engages the outer surfaces of the cams 7, 8, as shown in dotted lines in Fig. B, and the push-button is flush with the control lever. When a landing is to be made, the winch 27 is released from its pawl, allowing the lever 25 to swing downwards, whereupon the lever 15 engages under the end of the cam 7 as shown in full lines in Fig. B, so that when the lever 25 is moved upwards by contact with the ground, etc., the cam 7 swings the lever 15 back to the dotted-line position, thereby operating the control lever and the elevators; the lever 15 is disengaged from the cam 7 by riding on to the cam 8, when the necessary adjustment of the elevators has been made, and the push-button on the control lever is thereby depressed.





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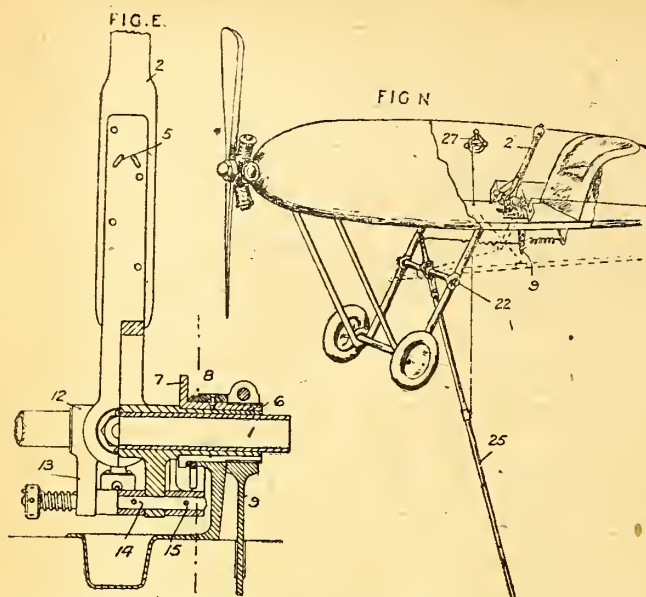
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The pilot can render the automatic device inoperative by depressing the push-button, thereby swinging the lever 15 out of the path of the cam 7.

MARKET REPORTS.

Prices given are for quantities on the usual terms.

May 3rd, 1917.

Several aircraft factories now run their own foundries, and will, therefore, be more than interested in the current prices of other metals (i.e., tin and lead) which they have now to purchase from time to time. The same information will also interest all founders. I have, therefore, decided to give a brief report of the market fluctuations of the prices of these metals in future reports.

COPPER.—There has been a further reduction in price since last week's report was sent to Press, and the decline forecasted has taken place, and although prices now seem fairly steady, a further decline is expected; in anticipation of this buyers are not exceeding their present requirements.

The output of the American firms is reaching a colossal figure, and this is bound to favourably influence the market.

Current Prices.

Copper (Standard) Ingot	...	£130 Cash
Copper Sheet	...	£165 per ton
Copper Tube	...	20½d. per lb.
Brass Sheet, 24 gauge	...	16½d. per lb.
Brass Tube S.D.	...	17d. per lb.

ALUMINIUM.—The official prices remain unaltered.

Current Prices.

Ingots	...	£225
Re-melted	...	£210
Aluminium Sheet 19G 2s.	10½d. per lb.	

TIN.—In common with all other metals, the demand for tin has considerably increased during the last two years. Prices are extremely high at present, and there does not appear to be much sign of a decline. A comparison of prices is given below:—

Comparative Prices.

To-day	...	£229 0 0
Last week	...	224 15 0
Last month	...	215 10 0
March average	...	207 10 0
May, 1916	...	200 0 0
May, 1915	...	150 0 0

LEAD.—There is not a very great demand for lead and the official prices are very reasonable.

Comparative Average Prices.

To-day	...	£30 0 0
Last week	...	30 0 0
Last month	...	31 0 0
1916	...	34 0 0
1915	...	21 0 0

STEEL.—There has been no serious alteration in prices. There is a general feeling that now the U.S. Government are talking of fixing maximum prices for Copper, they will also do the same with Steel; there should certainly be a substantial reduction.

The works here are still in a very congested condition, in fact, if the present output was increased five times, some of the Sheffield works would still be compelled to decline orders.

Current Average Prices.

R.A.F. 3A Steel Rounds	36s. per cwt. Basis.
R.A.F. 1E Steel Rounds	78s. per cwt. Basis.
R.A.F. 9A Steel Rounds	30s. to 32s. per cwt.

N.B.—Kindly note that last week's price for 1E should read as above, not 28s.

TIMBER.—Very little wood has arrived lately, and the position is becoming increasingly critical.

Importers and also buyers would feel a little more easier if they could see any prospect of the Admiralty shipments arriving.

The prices of Mahogany and Walnut remain very strong, and the demand for the former is increasing, and this alone will keep the price on the upgrade.

Current Average Prices.

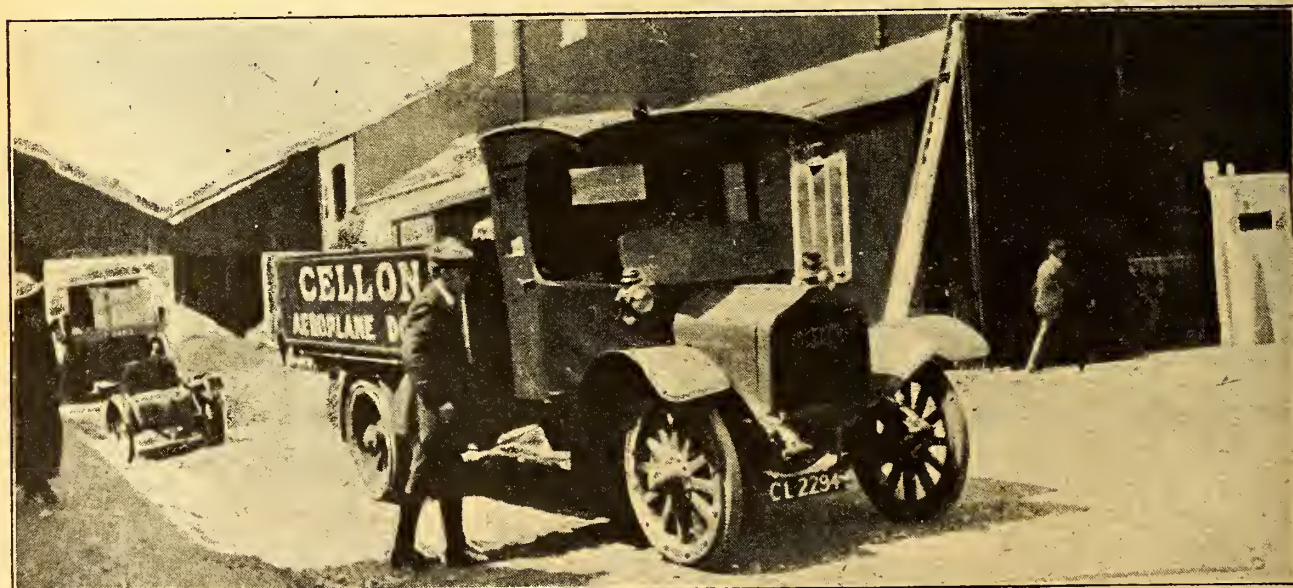
Silver Spruce	14s. to 15s. c.f.
English Ash	12s. to 13s. c.f.
Walnut	2s. 5d. to 2s. 7d. s.f. Plank.
Mahogany	2s. to 2s. 3d. s.f. Plank.

Prices are for selection and delivery.

FABRIC.—The official price for Fabric and Spaced Fabric has not yet been revealed. "Wait and See" appears to be the present position.

AN EXTENSION OF PREMISES.

The Glasse Manufacturing Co. announce that, owing to their extensive increase of business, they have found it necessary to take larger premises for their works at 20, Stamford Road, and at Hertford Road, Dalston, N.1. They have also secured more convenient offices at 209, City Road, situated next door to their present offices. All correspondence should be addressed accordingly. The telephone number remains the same, namely, City 9558.



CELLON ACTIVITY.—One of the Cellon Co.'s Selden Lorries delivering Cellon Dope.

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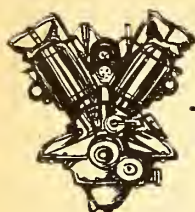
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AERO-MOTORS

IN KIND AND CONSTRUCTION

By Geoffrey de Holden-Stone



ON SACRIFICE.

Whatever else we may learn from life or engineering, this fundamental lesson is certain, if no other; that we can only get out of either what we ourselves put in. Nothing more; in fact, not so much. Some loss—whether by friction or farewell to our dearest illusions—is inevitable. How much, is the minus quantity of our own equation.

So it follows that the more we put in, at any rate, the greater will be the aggregate outcome. We must literally spare nothing. All must go in; all that we know and all we have, or we shall get nothing great for our pains. Whether we risk failure or death does not matter. Both are great things, hardly less than success or survival. It was not until he had burnt his last chair that Palissy rediscovered enamel, remember.

All uphill considerations seem to apply to two-stroke design in this way: that it is no use doing any less than our very best; no use being easily contented with a commonplace result, or content with any result just because it is ours. That is why, although we must be prepared to put in all we know or ever heard of in motor-practice of any kind—hence the value of history—we must be equally prepared to discard all that is unfit to the idea we have set before us; even to sacrifice our pet conceits and originalities if they seem to encumber the final scheme. That is why even a combination of known items, tried and proven, is better and more likely to succeed, than some desperate originality. There is no sense in standing a proposition on its head. Let the originality of the ambition suffice.

FOUNDATION AND BUILDING.

Hence it has always seemed to me that the base of success in two-stroke design must be physical rather than mechanical; indeed, that having once well and truly laid this foundation, the mechanical part is only the subsequent ashlar and brick-work. In the nature of the proposition then, we can hardly shape our conception better—no matter how vaguely at first—than upon the two physical objects of the best induction and exhaust we can contrive to imagine.

The rest—and the most probable way of achieving these—seems to be a matter of simplicity of execution on the mechanical side. Which—it is as well to remember—has the advantage of being cheaper. Hence the main thing to study, and embody wherever possible, is the single part and multiple-function idea.

THE GENERAL ABSTRACT.

That is why I have always thought that the ideal two-stroke

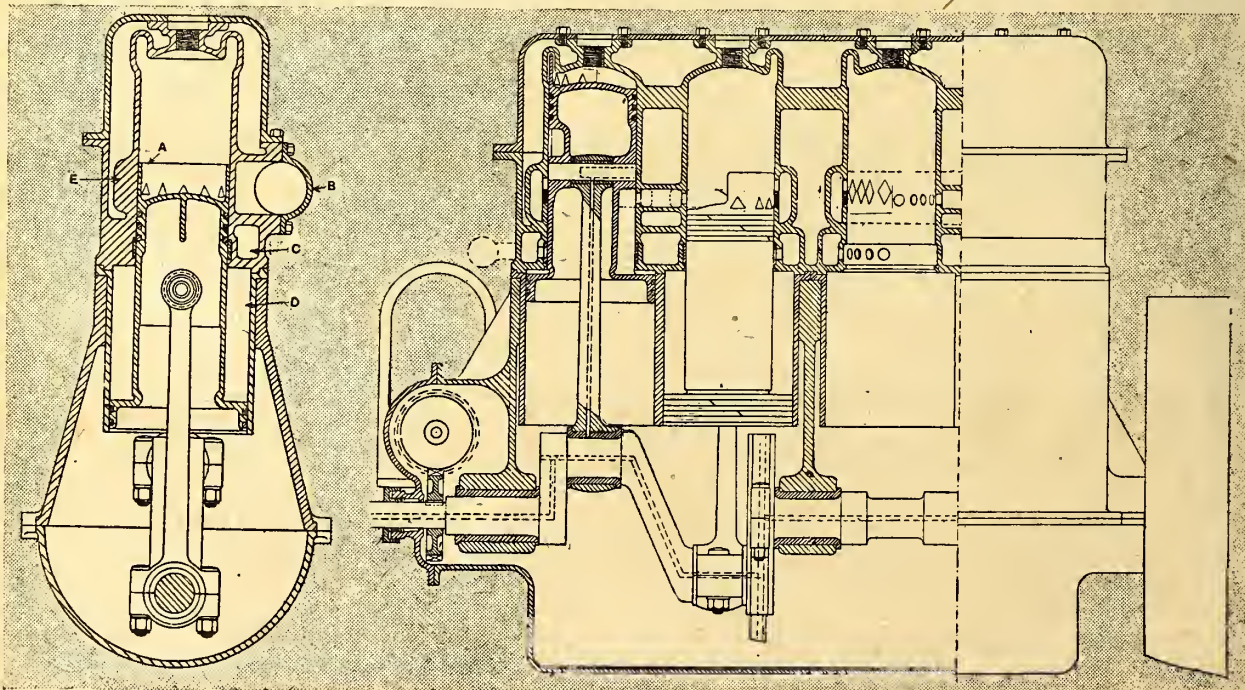
motor, as well as being valveless and independent of crank-chamber compression, should also be pipeless. That is to say, with all necessary piping and transference, self-contained and integral more or less with the motor-mass. This, at any rate, will probably save both weight and production cost; and we shall, no doubt, also find that it helps the achievement of the ideal induction-scheme better than any other system. Withal, we get even further on this line, and that of reducing production costs to the absolute minimum, if we work out the detail, not only so as to eliminate foundry wastage, but to lessen machining as far as possible. Then as to the matter of exhaust, it seems essential to embody the beautiful results in fuel-economy of the Daimler and Lahaussais systems, by some corresponding means, so as to conserve whatever calorific and explosive values that remain in partially burned exhaust gases.

Frankly, therefore, it has always seemed to me that the achievement of all this was not only practical, but would be rather a matter of original treatment, adaptation and combination of known means, than anything particularly revolutionary. Hence, therefore, my own later patent, which may be worth while describing in detail, if only to show from a purely constructional standpoint, how far it is likely to realise fundamental ideals.

A NEW COMBINATION.

At any rate, in view of the primary importance of even and unrestricted mixture-supply, I made induction the basis of the entire design. Therefore, bearing in mind the known extra-efficiency of hoop or "spectacle" induction, and also to do away with external piping and to shorten all passages, I formed all the primary induction transfer and exhaust passages in two annular inter-connected—or figure-of-eight—belt-like castings, upper and lower. These, as will be seen, enclose the base of each pair of cylinders, and are themselves completely surrounded by the open fosse-like lower half of a monobloc water-jacketing, which is, nevertheless, detachable.

Here it may be said that "shop" drawings alternatively permit these passage castings and the flange-topped water-fosse to be cast either integral with the working cylinders or with the lower charge pumping cylinders. The latter method I prefer, as it permits the double belting to be cast open inwardly, so that each separate and naked working cylinder after being machined all over once, and having its ports cut, may be dropped into the belting and secured by a half-turn in turret flanges—breech-block fashion—or by a locking ring. Either way, an abso-



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lute gas-tight grip is obtained, and the weight of all the con-
nectional foot-bolts saved.

SOME SPECIAL FEATURES AND ADVANTAGES.

Now the obvious advantages of the design so far—especially in the latter system of construction—are that cylinder wastage in the foundry is practically eliminated; and therewith the loss of time which is the most adverse factor in motor-production. At any rate—since pin holes will occur once in a way in spite of the most skilful handling—the detection of such a defect beforehand is, or should be, certain. Also, not only can the cylinders be given a single rough cut machining outside, as has been said, but replacement of a burst or broken cylinder is readily effected. Actually the union of the cylinders, as shown in the illustration—which is merely a Patent Office drawing, not a working one—is not in the least necessary; for if any couplings or intermediate steadies are required, they can, and should be made as detachable pieces.

The characteristic feature to be noticed here, however, is that the entire upper part of the water-jacketing consists of an inverted tank of light metal, moulded, hammered or pressed into shape, which is attached to—or rather buttoned down upon—the cylinder crown by the large nut-like breech-pieces which also contain the sparking-plugs. The usual difficulty of getting a water-tight joint in such cases, is overcome in a manner analogous to the Green, in practice. The edge of the tank is carried down just inside the water-fosse, and a horizontal flange is formed outside just above it: so that the two may contain a single endless rubber belt or gasket, which, abutting on the corresponding flange of the water-fosse casting, forms a leak-proof joint by the mere setting home of the breech blocks.

THE NOVEL MASS-BONDING.

Still another special constructional feature is the attachment of the belt castings—which are uniform with the lower or pumping cylinders—to the crank-chamber; a matter which is apt to be complicated with much bolting in differential-diameter constructions of the kind, essential as they are. The idea was not only to save this, but also to obtain easy machining to begin with, as well as absolutely automatic alignment. To effect this, the upper half of the crank-chamber has been divided or quartered lengthwise; so that the quarters shall grip the castings—lip and flange-fashion—and hold them *without* any bolts at all.

This done, the quarters are bonded together in the first place, by their ends, which have double lugs formed upon them: the actual bond consisting of steel H-shaped yoke-plates, inserted into and gripping the lugs, and themselves held in place by the bolts that suspend the end bearings of the crank-shaft in the conventional manner. The point about this contrivance is that apart from the natural strength of the yoke-plates, no disruptive lateral stresses exist here to tear the crank-chamber quarters apart. So the yoke-plates simply act as a dead-tight lock, detachable, with nothing tending to loosen it: a further bond for the crank-chamber mass being afforded by the adjustment nuts on the Renault type transverse suspension-tubes.

At any rate, it will be clear that on this construction alone not only is the weight cut down by ounces at a time up to an aggregate of many pounds, but that on a much-accelerated assembly, everything must interlock, as well as fit into place as in a jig.

AND INDUCTION SYSTEM.

Reverting now to the double belting, the circulation of the mixture is complete around the lower pair that surround each pair of cylinders, from entry-ports formed in the water-fosse wall.

Now, in either of its two types—for there is yet another, the

scheme of which includes direct-fuel-injection, automatically proportioned—this design is wholly *without* a carburettor. Instead, in the type illustrated, each entry port is trumpeted outwards to take a duplicate metal frame containing two gauze screens, between which a positively controlled slide moves over a series of fine jet holes in the base of the frame, which is bored out to receive a fuel connection.

By this simple device, as the inter-connected slides are drawn open, the air supply—divided *first of all* into minute streams by the outer screen—increases in a determinable ratio to the petrol supply, which is finely atomised through the inner gauze screen. Thus, to begin with, not only is the ponding due to petrol inertias at varying speeds, rendered wholly impossible at any speed or sudden variation, but it is impossible to get anything but an adequately proportioned mixture, or anything but absolute control. In the other type, of course, a mere slide without any fuel connection or jet-holes, and a single screen, suffices as an air-supply throttle.

The upper pair of belts—as will be seen by reference to the transverse section—are, however, divided by a septum across each, dividing the induction and transfer portion—which is intermediate to each pair—from the exhaust portion, which lies on the outer half section: that is, at the ends and middle.

SOME MOTIVES: AND THE RESULT.

This arrangement is, of course, arbitrary. It was, nevertheless, schemed out for two reasons: the physical advantage of obtaining the shortest and most direct transference possible, and the mechanical one of getting the entire transference and pressure storage well *inside* the motor mass, so that the motor should be—unlike the majority of two-strokes—*without* undue bulkiness, as well as without external piping.

Now, closer examination—which would be clearer in a plan-view of this belting scheme—will show that the two adjacent halves of the duplicated induction portion, constitute a central, and united X-shaped transfer, common to both cylinders, and, at the same time, a storage-chamber also common to both cylinders, the capacity of which is about equal to—but certainly not less than—that of the working end of one cylinder.

Consequently, it follows that, while the pressure should hardly ever exceed the normal of one and a-half to two atmospheres—which experience has found to be the best maximum for two-stroke practice efficiency—the storage-chamber must always contain a full charge lying ready for immediate induction into the working cylinder, as soon as the slide-valve function of either piston permits it to emerge. On the other hand, it will be seen that the piston-trunk holds it from returning, as soon as it has been forced into the pressure-storage-chamber by the pumping end of the piston: actual leakage, however, being prevented by fitting one of that type of pressure-ring known as a choke-ring. It is the reverse of a piston-ring; that is to say, surrounding the piston-trunk, which moves freely within it, but sprung into a groove in the cylinder-wall.

Incidentally, it is an easy ring to insert, when you know how. Nor is it difficult to get the piston-body inside it, when you have been shown. The best rings of the kind are of the compound type, made of sections of bronze tube, with their edges overlapping one another. Anyway, such a ring is the final—and essential—detail which, combined with D cavities in the pistons, alone secures the two-stroke ideal of being entirely without valves. As in this case.

(To be continued.)

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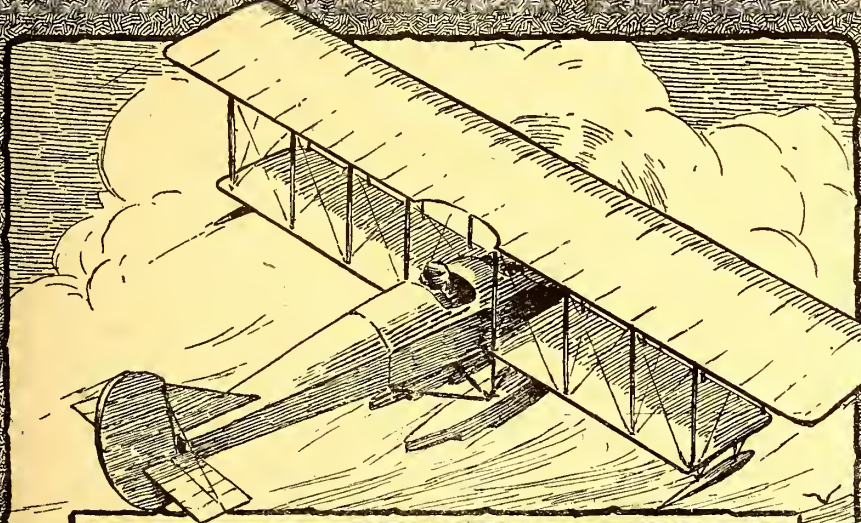
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(Continued from page 1188.)

Welsh, Sec. Lt. E. A., R.F.C.
 KILLED.—R.F.C.—Bolton, 65391 2nd Cl. Air Mech. J. H. (Blackpool).
 Mitchinson, 8983 2nd Cl. Air Mech. F.G. (Chippenharn).
 DIED OF WOUNDS.—R.F.C.—Bramley, 10473 2nd Cl. Air Mech. T. (Rochdale).
 DIED.—R.F.C.—Grindley, 37213 2nd Cl. Air Mech. J. W. (Everton).
 WOUNDED.—R.F.C.—Dickson, 44739 2nd Cl. Air Mech. H. (Swindon).
 MISSING.—R.F.C.—Ming, 61783, Sec. Cl. Air Mech. F. (St. Nicholas, Spalding).

Reported May 3rd.

WOUNDED.—Clarke, Sec. Lt. R. B., R.F.C.
 De Lavison, Sec. Lt. A. M. N., London Regt. and R.F.C.
 Knowles, Capt. R. M., M.C., Norfolk Regt., attd. R.F.C.
 Owen, Capt. H. L. H., Dorset Regt. and R.F.C.
 Quinell, Capt. A. V., Liverpool Regt., attd. R.F.C.
 Robertson, Lt. N. L., R.F.C.
 MISSING.—Halse, Sec. Lt. C. H., R.F.C.
 Hicks, Lt. G. E., R.F.C.
 Hildyard, Sec. Lt. B. V., E. Yorks Regt. and R.F.C.
 Johnston, Sec. Lt. A. R., R.F.C.
 Matthews, Sec. Lt. F. A., R. Sussex Regt., attd. R.F.C.
 WOUNDED.—R.F.C.—Dilley, 3591 2nd Cl. A.M. A. O. (Lavender Hill, S.W.)
 MISSING.—R.F.C.—Burgess, 19135 Sgt. H. P. (Hyde Park, W.); Walker, 9329 2nd Cl. Air Mech. A. G. (Polesworth).
 OVERSEAS FORCES.—DIED.—AUSTRALIAN FLYING CORPS.—Rayment, 49 Air Mech. W. C.

Reported May 4th.

KILLED.—Darnell, Sec. Lt. C. V., Connaught Ran. and R.F.C.
 Mott, Sec. Lt. L. W., Essex R., attd. R.F.C.
 Ralphs, Sec. Lt. A., R.F.C.
 White, Sec. Lt. M. A., R.F.C.
 Wilson, Lt. C. E., R.F.C.
 PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Baker, Capt. A. F., Duke of Cornwall's L.I., attd. R.F.C.
 Etches, Sec. Lt. A. J. E., R.F.C.
 Will, Lt. J. G., R.F.C.
 WOUNDED.—Collins, Sec. Lt. V. H., R.F.C.
 Rossi, Sec. Lt. J. A., R.F.C.
 MISSING, BELIEVED DROWNED.—Anne, Capt. C. E. I. C., R.F.C.
 MISSING.—Clifford, Sec. Lt. W. J., R.F.C.
 Dilnutt, Lt. E. J., R.F.C.
 Tomkies, Sec. Lt. H. L., Sherwood Foresters, attd. R.F.C.
 Turnbull, Sec. Lt. A. M., R.F.C.
 OVERSEA FORCES.—PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Rogers, Lt. G. R., Can. Field Art'y, attd. R.F.C.
 WOUNDED.—Stone, Lt. R. S., Canadian Inf., attd. R.F.C.
 MISSING.—Graves, Lt. C. L., Canadian Inf., attd. R.F.C.
 Nicholson, Lt. H. R., Canadian Pioneers, attd. R.F.C.

Reported May 5th.

KILLED.—Barltrop, Lt. E. A., R.E. and R.F.C.
 O'Sullivan, Sec. Lt. F., N. Staffs Regt. and R.F.C.
 WOUNDED.—Beal, Sec. Lt. L. W., R.F.C.
 Clarke, Sec. Lt. R. B., E. Surrey Regt. and R.F.C.
 Henderson, Sec. Lt. M. P., R.F.C.
 Kann, Lt. R. V., R.F.C.
 MISSING.—Burbury, Lt. A., M.C., Yorkshire Regt., attd. R.F.C.
 Capon, Sec. Lt. R. S., Liverpool Regt. and R.F.C.
 Spence, Sec. Lt. W. S., R. Scots. and R.F.C.

Reported May 7th.

KILLED.—Smith, Lt. P., R.E., attd. R.F.C.
 PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF WOUNDS.—Stafford, Sec. Lt. F. J. E., R.F.C.
 WOUNDED.—Clark, Sec. Lt. E. A., R.F.C.
 Edwards, Sec. Lt. W. M., R.F.C.
 Langton, Sec. Lt. E. S. W., Lond. R., attd. R.F.C.
 Lowcock, Capt. R. J., M.C., Sher. For., attd. R.F.C.
 MacKay, Sec. Lt. D. R. G., A. and S. H., and R.F.C.
 Mars, Sec. Lt. L. J., Yco. and R.F.C.
 Perryman, Sec. Lt. A. C., Middx. R., attd. R.F.C.
 Robinson, Sec. Lt. P., R.F.C.
 Rudling, Sec. Lt. E. R., R. W. Surr. R. and R.F.C.
 Selby, Capt. J. G., R.F.A. and R.F.C.
 Watkinson, Sec. Lt. A. E., E. Yorks R., attd. R.F.C.
 Young, Sec. Lt. A. L. G., Lond. R. and R.F.C.
 MISSING.—Allan, Sec. Lt. L. E., Yco. and R.F.C.
 Baerlein, Sec. Lt. A. A., R.F.A., attd. R.F.C.
 Follit, Sec. Lt. R. W., R.F.C.
 Hawkins, Capt. H. R., R.F.C.
 Hope, Lt. H. B. T., North'n R. and R.F.C.
 Kirkham, Sec. Lt. F. J., R.F.A., attd. R.F.C.
 McEntee, Sec. Lt. G. O., R. Fus., attd. R.F.C.
 Mercer, Sec. Lt. W. K., Gord. Highdrs. and R.F.C.
 Stewart, Sec. Lt. J. D. M., R.F.C.
 Stonier, Lt. W. J., Bedf. R. and R.F.C.
 Thomson, Lt. T., A. and S. H. and R.F.C.
 Wischer, Sec. Lt. J. V., R.G.A., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS AS A PRISONER IN GERMAN HANDS.—Blythe, Sec. Lt. H., R.F.C.

PREVIOUSLY REPORTED PRISONER, NOW REPORTED WOUNDED AND PRISONER IN GERMAN HANDS.—Daly, Capt. A. P. V., Connaught Rangers, attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Bloomfield, Capt. W. S. R., R.F.C.
 Coops, Sec. Lt. F. C., L'pool R., attd. R.F.C.

Cross, Sec. Lt. R. W., R.F.C.
 Garland, Sec. Lt. F. J. R., Glouc. R.
 Haseler, Sec. Lt. G. F., R. W. Sur. R., attd. R.F.C.
 Lees, Capt. A., R. W. Kent R., attd. R.F.C.
 Lonsdale, Sec. Lt. V. O., R.F.A., attd. R.F.C.
 Shepard, Sec. Lt. T., R. War. R., attd. R.F.C.
 Schreiber, Lt. R. T. B., Suff. R. and R.F.C.
 Wild, Sec. Lt. F. J., E. Lancs R.

PREVIOUSLY REPORTED MISSING, BELIEVED PRISONER IN BULGARIAN HANDS, NOW REPORTED PRISONER IN BULGARIAN HANDS.—Stopher, Sec. Lt. A. C., R.F.C.

OVERSEA FORCES.—KILLED.—McMurtry, Maj. E. O., attd. R.F.C.

Mason, Lt. H. D., attd. R.F.C.

WOUNDED.—Pitblado, Lt. E. B., Canadian F.A., attd. R.F.C.

MISSING.—Allen, Capt. A. S., M.C., Can. Inf., attd. R.F.C.

Campbell, Lt. W. A., attd. R.F.C.

Rathbone, Lt. G. H., Can. Inf., attd. R.F.C.

DIED OF WOUNDS.—R.F.C.—O'Connor, 6337 2nd Air Mech. W.

WOUNDED.—R.F.C.—McQueen, 14584 1st Cl. Air Mech. D.; Sisson, 2783 1st Cl. Air Mech. T.; Waite, 19580 Act. Cpl. A. R.
 Reported May 8th.

KILLED.—Bate, Sec. Lt. G. B., N. Lancs. R., attd. R.F.C.

Black, Sec. Lt. J. S., R.F.C.

De Berigny, Sec. Lt. C. E., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Thomas, Sec. Lt. C. L. S., Border Regt., attd. R.F.C.

WOUNDED.—Campbell, Sec. Lt. H. J. Q., R.F.C.

Doughty, Sec. Lt. R. C., R.F.C.

Gogarty, Sec. Lt. A. J., R.F.C.

Hayward, Sec. Lt. J. H., R.F.C.

Hutchinson, Capt. H. G., R.F.C.

Mackrow, Sec. Lt. N. H., R.F.C.

Musson, Sec. Lt. J. M., R.F.C.

Soutten, Sec. Lt. B., R.F.C.

Sturt, Lt. C. G., R.F.C.

Westlake, Sec. Lt. J. H., R.F.C.

MISSING.—Applin, Sec. Lt. R., R.F.C.

Bowers, Lt. P. T., R.F.C.

Brewis, Lt. J. A. G., Durh. L.I., attd. R.F.C.

Cairns, Sec. Lt. J. A., A. and S. Highrs. and R.F.C.

Croker, Sec. Lt. F. R., Lancs. Fus. and R.F.C.

Davies, Sec. Lt. D. E., R.F.C.

Hamilton, Lt. W. N., R.F.C.

Handley, Sec. Lt. F. A. W., R.E., attd. R.F.C.

Harvey-Kelly, Maj. H. D., D.S.O., R. Irish R., attd. R.F.C.

Houghton, Sec. Lt. D. L., Midd'x R., attd. R.F.C.

Jennings, Sec. Lt. E. D., R.F.C.

Kay, Sec. Lt. M. A., R.F.C.

Lingard, Sec. Lt. J. R., Ches. R., attd. R.F.C.

Milling, Lt. H. B., R.F.C.

Percival, Sec. Lt. E., Norf. R., attd. R.F.C.

Wills, Sec. Lt. S. T., North'n R., attd. R.F.C.

MISSING.—R.F.C.—Gosney, 61870 2nd Cl. Air Mech. H. V.

PERSONAL NOTICES.

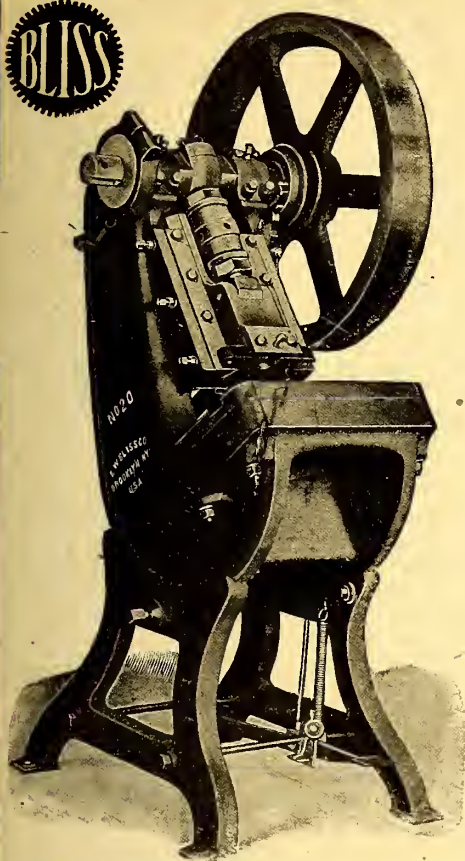
DEATHS.

ALLAN.—Sec. Lt. Lawson E. Allan, Yeomanry, attached R.F.C., who was killed on April 26th, was the youngest son of Mr. and Mrs. James Allan, of Oxtou, Cheshire, his father being sub-manager of the London and Lancashire Fire Insurance Company. Educated at Sedburgh, he secured a commission in the Yeomanry two years ago. In November, 1915, he went to the front as signalling officer, and a year later joined the R.F.C. as an observer. He was due home shortly to qualify for his pilot's certificate.

ANNE.—Major Crathorne Edward Igham Charlton Anne, Royal Flying Corps, whose death was recorded last week, was in his 25th year. At the outbreak of war he obtained a commission in the 6th K.O.Y.L.I., and quickly gained a reputation as a smart and capable officer. After a short time he transferred to the R.F.C., and flew to France early in the summer of 1915. After a short period he sustained a serious accident while flying, and owing to subsequent ill-health returned to England to undertake the training of pilots, in which he was very successful.

His last post was that of Chief Instructor at the School of Military Aeronautics at Oxford, for which duty he was gazetted temporary Major. He was mentioned in dispatches "for valuable services rendered."

At the time he was drowned he was on his way out to take up



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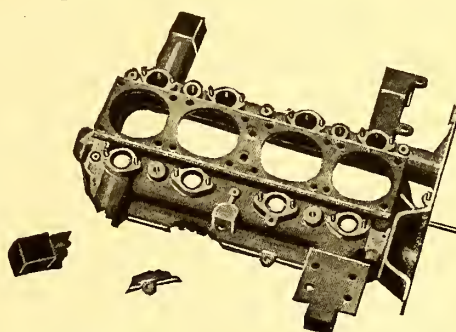
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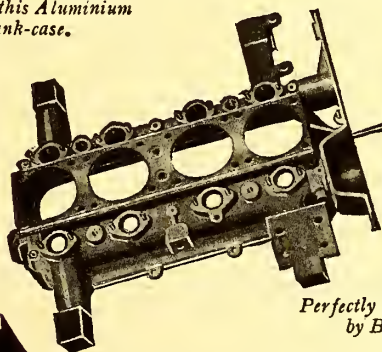
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the post of Chief Instructor and Commandant of a School of Aeronautics in the Middle East, and it is known that he sacrificed his life in attending to the needs of the men under his charge.

His late C.O. writing to Major Charlton Anne's family, says: "He was such an excellent instructor, and I always had such absolute confidence in him at the school, that his loss is very great to the Royal Flying Corps, and his loss to his friends—he had no enemies—will be felt most sincerely."

BARLTROP.—Lt. Eric Arthur Barltrop, R.E., attached R.F.C., whose death was announced last week, was educated at St. John's School, Leatherhead, and at Queen's College, Cambridge, where he took his B.A. degree. On the outbreak of war he enlisted in the Royal Engineers, receiving his commission in the same corps in November, 1914, and being promoted Lieutenant in the following March. In September, 1915, he proceeded to Gallipoli, where he was employed as Brigade Signal Officer, and, on the evacuation of the peninsula, he was sent to Egypt, where he contracted typhoid, and was invalided home in February, 1916.

He joined the R.F.C. in October, and, receiving his pilot's certificate on March 28th last, joined his squadron at the front soon after. On April 23rd, during an action in the air, he was shot through the head and killed.

BARNE.—Capt. Seymour Barne, M.C., Hussars, att'd. R.F.C., was the youngest son of the late Lt.-Col. St. John and Lady Constance Barne, of Sotterley and Dunwich, Suffolk, and the nephew of the late Marquess of Hertford. He was educated at Eton, and, joining the Hussars, was with his regiment during the retreat from Mons, and was wounded at the first battle of Ypres. He received the Military Cross.

Since 1915 he held a Staff appointment with a cavalry brigade. Recently, however, he felt it his duty to volunteer as a cavalry observer with the R.F.C. In this capacity he was flying over the line on April 23rd, and was shot down by an enemy aeroplane. He was regarded as an exceptionally gallant, fearless, and promising young cavalry officer.

FOOTE.—Lt. Foote, R.F.C., was killed on May 4th while flying at Montrose. When 50 ft. up the aeroplane dived to earth and burst into flames. The fire was so fierce that no one could get near to help the aviator, who was burned to death. Mr. Foote, who was 24 years of age, belonged to Bo'ness.

GOWER.—Sec. Lt. Lancelot John Gower, R.F.C., who was killed in an aeroplane accident on May 1st, was the only son of Mr. and Mrs. Herbert Gower.

HARTNEY.—Lt. James C. Hartney, Canadian General List and R.F.C., who was killed while observing on May 1st, was the son of Mr. and Mrs. James Hartney, Toronto, Canada.

HOPE.—Lt. Humphry Brian Thomasson Hope, Northamptonshire Regt. and R.F.C., who was killed in action on April 26th, during an encounter with hostile machines, was the younger son of the late W. H. Hope, of Wellingborough, and Mrs. Hope, of Hunstanton.

McMURTRY.—Major Eric Ogilvie McMurtry, Canadians, att'd. R.F.C., who was killed in action on April 28th, was the youngest son of Mr. and Mrs. S. A. McMurtry, of Montreal, Canada, and husband of Amy McMurtry. He was aged 22 years.

MOTT.—Sec. Lt. Lewes Woodham Mott, Essex Regt., attached R.F.C., who was killed in action on April 23rd, was the only son of T. W. and Mrs. Mott, of 2, St. Stephen's Lawn, Cheltenham and of Much Hadham, Herts. He was 20 years of age, and had his commission in January, 1915.

PATTERSON.—Sec. Lt. H. C. Patterson, Bedford Regt., att'd. R.F.C., who has been killed in an aeroplane collision, was the only son of the late T. M. Patterson and Mrs. T. M. Patterson, of Littlebourne, Kent.

PILE.—Lt. Cyril John Pile, R.F.A., R.F.C., who was killed on April 29th through his machine collapsing after an air fight, was the youngest son of Sir Thomas D. Pile, Bart., Kenilworth House, Willesden Lane, N.W. He was aged 19.

Mr. Pile had his commission in the R.F.A. Special Reserve in Sept., 1915, and was gazetted Flying Officer, R.F.C., in Jan., 1916.

PURVIS.—Sec. Lt. John William Purvis, R.F.C., was killed while flying a biplane in Suffolk on May 2nd. The machine appears to have struck the top of a tree. He was 28 years of age.

SMITH.—Lieut. Peter Smith, R.E., att'd. R.F.C., who was killed in action on April 28th, was the youngest son of the late B. H. Smith and of Mrs. Berthold Smith, 27, The Boltons, S.W. He was aged 23.

STAFFORD.—Sec. Lieut. Ewart Stafford, R.F.C., who was mortally wounded on the Western front on April 11th, was 19 years of age. He was the elder son of Mr. and Mrs. E. D. Stafford, The Green, Haywards Heath, and grandson of the late Alderman J. E. Stafford, J.P., formerly Mayor of Brighton. On leaving Mill Hill School in August last, he immediately obtained a commission in the Royal Flying Corps, on the nomination of the headmaster, Sir J. McClure, and Major-Gen. Sir J. Moody. He showed great aptitude for flying, and passed rapidly through the training course. He went to the front in February, and had since been actively engaged in the arduous

and daring work which has made the Flying Corps famous in the recent operations. Whilst in contact duty over the German lines at Wancourt, he received a bullet wound, and though suffering from a broken leg he pluckily stuck to his machine and landed his observer safely, tainting through loss of blood before reaching the ground. He received hasty attention from a cavalry doctor, who was himself wounded by shell fire while treating him. He was conveyed to the advanced base hospital at Abbeville, at which, owing to his critical condition, his parents received War Office permission to visit him, and where they were with him to the end. He died on Sunday, April 22nd, and was buried in the Soldiers' Cemetery at Abbeville.

STEDOLPH.—An aeroplane piloted by Flt. Sergt. W. E. Stedolph, R.F.C., came to grief on May 1st while flying over Farnborough. The pilot was killed instantly. The machine fell in the Reading road and was smashed to pieces.

TROLLOPE.—Sec. Lieut. William Kennedy Trollope, R.F.C., who died on May 3rd, from wounds received in aerial conflict with the enemy on April 30th, was the younger son of John Evelyn and Mary Maud Trollope, of the Tile House, Esher. He was in his 21st year.

TROLLOPE and CALDWELL.—Lts. Trollope and Caldwell were killed while flying in Yorkshire on May 4th. Mr. Trollope belonged to Bromley, Kent, and Mr. Caldwell is said to have come from Australia.

A verdict of "Accidental Death" was returned at an inquest held on May 7th. It was stated that Mr. Trollope had charge of the machine at the time of the accident. The engine failed, and the machine spun to earth. Both officers were instantaneously killed.

Sec. Lt. Cyril Harvey Trollope, London Regt. and R.F.C., was the only child of Mr. and Mrs. John Basil Trollope, of 8, Oaklands Road, Bromley, Kent, and grandson of the late Joseph Harvey Trollope, of Queenswood, Beddington, Surrey. Born in 1897, he was educated at Colquhoun Villa and Larchfield School, Helensburgh, and at Fettes, where he was in Moredun House. He was in the O.T.C. and shot for the school team at Bisleigh in 1914. In 1915 he joined the London Regiment, in which he obtained his commission. He transferred to the R.F.C. in 1916, and received his "wings" shortly before his death.

TURNBULL.—A verdict of "Accidental Death" was returned at the inquest, at Knaresborough on May 7th, on Lt. Gibson Turnbull, R.F.C., whose body, with the neck broken, was found in the river Nidd on May 5th by his wife, while she was walking by the river side.

It was stated that Mr. Turnbull, after alighting in a field, rose again, but his machine struck a hedge and dived in the water.

WEAVERS.—First Cl. Air Mech. Arthur Weavers was burned to death in Kent, on May 2nd. He was observing in a biplane when the machine side-slipped soon after leaving the ground, struck a building, and caught fire. The pilot was rescued, but the men who lifted him out did not notice Weavers, but, according to the evidence at the inquest, it would have been impossible to have rescued him owing to the flames. A verdict of death from misadventure was returned, the jury commending the soldiers who saved the pilot.

YOUNG.—A verdict of accidental death was returned at an inquest at Hull on May 1st on the body of Herbert Young, 39, of Hounslow, London, air mechanic in the R.F.C., who was killed on the previous day while flying a biplane. The evidence showed that Young, who was under instruction in aviation, flew into a cloud, where he lost his sense of orientation, and emerging found that the machine had tilted a little. In attempting to right the biplane he over-corrected, with the result that it capsized. The machine flew into some allotments, and the pilot sustained a fractured skull and other injuries.

MARRIAGES.

BARR—BELL.—On May 5th, at Taunton, Lt. Eric Douglas Barr, M.C., R.F.A. and R.F.C., youngest son of the late H. Bannister Barr, and of Mrs. Barr, of Bexhill-on-Sea, was married to Mavis Irving, eldest daughter of Mr. and Mrs. Herbert Irving Bell, of Wilton House, Taunton.

BROKESHIRE—VAN HOMAN.—On April, 26th Sec. Lt. Lawrence Annesley Brokeshire, R.F.C., eldest son of the Rev. W. H. Brokeshire, D.D., and Mrs. Brokeshire, of Hallowell, Maine, U.S.A., was married by special licence to Corona Constance, only daughter of Ernest van Homan and Mrs. van Homan, of "Langland," 238, Finchley Road, Hampstead.

HOLMAN—GOODSON.—On the 5th inst., at St. Mary's Church, Shortlands, Clifford Evans, Capt., Glosters and R.F.C., only son of Lt.-Col. and Mrs. G. E. Holman, Buckhurst Hill, was married to Hilda, second daughter of the late Thomas Goodson, Esq., J.P., Hill House, Mitcham, by the Rev. G. E. Hall, B.A., assisted by the Rev. H. T. Knight, M.A., vicar of the parish.

McDOWELL—DAVEY.—On April 30th, at All Saints' Church, Clapham Park, S.W., Capt. T. Hudson McDowell, R.G.A. and R.F.C., of Belfast, was married to Eva Mary Davey, daughter

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of Mr. and Mrs. George Davey, of Clapham Park, S.W., by the Rev. E. A. Wright.

STEWART—OLIVER.—On May 1st, at St. Mary's Parish Church, Morpeth, Capt. Douglas Stewart, R.F.C., was married by licence to Louisa Margery, eldest daughter of Robert Charles Oliver, J.P., and Mrs. Oliver, Bowmer Bank, Morpeth, Northumberland, by the Rev. Canon Davies.

ENGAGEMENT.

MINCHIN—FULLER.—The marriage arranged between Capt. J. Humphrey Cotton Minchin, the Cameronian and R.F.C., and Miss Violet Fuller, will take place at 1.45 p.m., May 17th, at Holy Trinity Church, Brompton. All friends will be very welcome at the church.

BIRTHS.

HACK.—On April 30th, at Catterick, Yorkshire, the wife of Lionel Hack (R.F.C.), of Holmwood, Surrey—a son.

SCHOLTE.—On April 26th, at Woodside Nursing Home, Charing Cross, Glasgow, to Hilda, wife of Major F. L. Scholte, R.F.C., a daughter.

[Owing to a lamentable printer's error this item of news appeared recently as if Major Scholte had been killed in an accident. One is happy to record that he is well and fit.—Ed.]

The special correspondent of the Havas Agency at the British front telegraphs that the French Aviation Militaire at the front has sent to Major-General Trenchard and the officers of the Royal Flying Corps on the Western front the following expression of its admiration:—

French aviators congratulate their British comrades on their superiority over their adversaries, which they have never ceased to retain during the recent engagements.

They thank them for enabling French aviators to obtain splendid success recently by giving them their generous support.

They declare that, amazed as they are by the exploits of the British aviators, they will be inspired by the same principles and will make it their ambition to apply the same methods to French aviation.

The Royal Flying Corps, the correspondent says, were extremely flattered by this cordial message and see in it a fresh proof of the fraternal sentiments which have never ceased to exist between the British and French Armies in general and the Air Services in particular.

* * *

The following message from the military correspondent of the "Times" appeared on May 4th.

I only saw two German aeroplanes cross our lines during my visit to the British front, and when some of ours came up and drove them off I thought that ours looked like thoroughbreds and the German hackneys. There were, however, plenty of German aeroplanes on the German side of the line, as well as many observation balloons. The Fokker is fairly played out on the Western front, where the Albatros one-seater and the Halberstadter represent the best single-seater fighting machines of the enemy. The former has two guns firing through the propeller and a 160-h.p. Mercedes engine. The Roland, the L.V.G., the Rumpler, and the Aviatik are the most common two-seater types. Fighting reconnaissance, and artillery work are carried out by separate units, and a sharp distinction is drawn between these different spheres of aerial activity. The organisation of the German Air Service is fairly well known to us, and we also know to our cost that *we were met by superior numbers of fast single-seater fighting machines* at the opening of this year's campaign. [There was a fair warning in THE AEROPLANE as far back as November last.—Ed.]

We must make up our minds that *whenever we relax our efforts at home a great nation like the Germans will beat us*, and this is not true of aviation alone. The Germans produce some star pilots who are quite good, and I fancy that the personnel in the German observation balloons is drawn largely from the artillery, as it should be. But I should say that the general level of efficiency is higher in our Service than in the German, and assuredly despite the enemy's good fast fighters, and his numerous anti-aircraft batteries and sections, he has accomplished much less than our men, and our pilots retain all their offensive spirit.

We must expect ups and downs in a novel service of this kind when so much science and industry are arrayed against us, but the unconquerable spirit of our men will prevail in the end *if only the home organisation is equal to the energy at the front.*—[The italics are ours.—Ed.]

* * *

Miss Robinson, sister of Capt. Leefe Robinson, V.C., in a statement made last evening to a Press representative said:—

"I have received a letter from my brother's commanding officer in France, in which he says that a German aviator who was captured in France states that my brother, Capt. Robinson, is also a prisoner. The letter does not say anything about his being wounded or not wounded, but a friend of mine received a letter

from a man in the front line of trenches five days ago, who says that a German aviator flew over our trenches to drop a wreath for a comrade who had been killed flying, and he also dropped a letter stating that my brother was wounded and a prisoner." Since then a cheque from Capt. Robinson has been received in London.

* * *

At a general court-martial opened in Peterborough on May 7th, five officers attached to the R.F.C. were charged with conduct to the prejudice of good order and discipline by behaving in an improper and disorderly manner at the Grand Theatre, Peterborough.

One of the principal witnesses for the prosecution was Sir Richard Winfrey, Parliamentary Secretary to the Board of Agriculture, who was subpoenaed.

In cross-examination by Mr. Ernest Wild, K.C., Sir Richard said he was not a strict temperance man, but he had taken the King's pledge. He added amid laughter, "I hope you have done the same, Mr. Wild."

FRANCE.

OFFICIAL COMMUNIQUÉS.

MAY 1st.—Between April 24th and 30th Sous Lt. Delorme brought down his twenty-first enemy machine and Adj. Madon his ninth. Adj. Lufbery, of the "Lafayette" squadron, has up to the present accounted for nine German aeroplanes.

MAY 2nd.—On the night of April 30th-May 1st our bombarding squadrons dropped many bombs on several railway stations and military establishments in the region of Laon-Vouziers-Rethel. Fires were seen to break out.

As a reprisal for the bombardment of Châlons and Epernay by German aeroplanes during the night of April 29th-30th, five of our machines last night flew over the town of Treves, on which they dropped numerous projectiles. All the shells hit the mark. A conflagration of great violence, which spread rapidly, broke out in the centre of the town.

During April 30th and May 1st our pilots brought down three German aeroplanes. Other enemy machines were seriously damaged.

MAY 3rd.—During May 2nd our chasing aeroplanes were particularly active. During numerous air fights fought by our pilots, four German machines were brought down and 15 others were seen to fall in their lines damaged.

During the night of April 29th-30th one of our air squadrons bombarded the station and factories of Thionville. During the morning of May 1st our aeroplanes dropped 320 kilogrammes (over one third of a ton) of projectiles on the aviation camp of Sissonne (east of Laon). The following night the same camp received 2,000 kilogrammes (two tons) of explosives. A great conflagration was observed in the sheds.

During the night of May 1st-2nd one of our groups bombarded the stations of Bétheniville, Pont Favarger, and Châtelet-sur-Retourne (on the Reims front), where a very furious conflagration, accompanied by several explosions, broke out.

MAY 4th.—On May 3rd our pilots brought down five German machines. It is confirmed that three of the enemy machines which were reported as having been seriously damaged during the fighting on May 2nd were really brought to the ground.

A German machine towards 10 p.m. yesterday dropped several bombs on the region of Dunkirk. There were no victims, and no damage was done.

MAY 5th.—ARMY OF THE ORIENT.—The enemy depot at Cestovo was bombarded by British aircraft.

MAY 6th.—On Thursday night and on the night following our bombarding squadrons dropped 8,500 kilos (eight tons and a half) of explosive on military establishments, railway stations, and bivouacs belonging to the enemy, notably on the factories of Hagondange (about seven miles north of Metz). Several fires were seen to break out at the points bombarded.

During Friday our pilots brought down three German aeroplanes. A fourth enemy machine was brought down by the fire of our anti-aircraft guns.

* * *

It was reported that on May 3rd, at midday, a duel took place above the commune of Rosendaël-by-Dunkirk between a British and a German aeroplane, in which the former was victorious.

Both the German aviators were killed, the observer being shot out, with one of the wings of the machine, 500 yards away from the body of the machine, which fell 200 yards outside the town gates.

* * *

It is reported that Capt. René Doumer, of the Aviation Militaire, son of Senator Paul Doumer, the well-known Parliamentarian, is missing. It is believed that he has been captured by the Germans.

GERMANY.

OFFICIAL COMMUNIQUÉS.

MAY 1st.—Yesterday (April 30th) 22 enemy aeroplanes were shot down in aerial fighting and three by fire from anti-aircraft guns.

Three of our one-seater battleplanes attacked a group of five



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French captive balloons north-west of Reims, and brought them all down in a burning condition.

MAY 2nd.—WESTERN FRONT.—The enemy yesterday lost 14 aeroplanes in aerial engagements. Lt. Wolff shot down his 28th and 29th opponents, and Lt. Schaefer his 24th and 25th.

Yesterday morning a number of our seaplanes attacked some enemy merchant ships off the Thames and sank a large steamer of about 3,000 tons.

One of our machines has not returned, and it is supposed that it is lost.

[See Admiralty communiqué of same date.—Ed.]

EASTERN FRONT.—One of our air squadrons undertook, with perceptibly good effect, a bombing attack against a munitions depot, near Bac, on the Tchernia.

MAY 3rd.—Aerial activity over and behind our positions (on the Western front) both by day and night was very lively.

The enemy's losses in aerial engagements consist of one captive balloon and eight aeroplanes. One of the aeroplanes was lost by a forced landing, seven by anti-aircraft gunfire.

MAY 4th.—With the favourable weather on the Western front there is lively aerial activity. Battery positions, railway establishments, camps, and munition depots near Arras and to the south of the Aisne have been successfully bombed by our aviators.

The enemy lost 10 aeroplanes.

MAY 5th.—The enemy yesterday lost seven aeroplanes and one captive balloon.

By an aerial attack on Ostend a large number of Belgians were killed and wounded. No military damage was done.

MAY 6th.—In aerial battles and by anti-aircraft fire the enemy lost 14 aeroplanes. Two balloons were shot down.

MAY 7th.—On May 6th our aviators brought down 14 enemy aeroplanes.

* * *

It was reported from Geneva on April 30th that a new Zeppelin, while out on its trial trip, fell near Friedrichshafen from a height of 300 ft.

An engineer and three workmen were killed, and the airship was badly damaged. Other accounts call it an aeroplane.

It was reported from Amsterdam on April 26th that German deserters arriving at Maastricht state that on Monday one of the newest Zeppelins was destroyed in a storm on a trial trip between Friedrichshafen and Wilhelmshafen.

The gale overturned the airship east of Duisbourg, an explosion ensued, and the wreckage fell in a wood. The crew, including two under-managers of the Zeppelin works, were killed.

[Probably both reports refer to the same event.—Ed.]

* * *

The Exchange Telegraph Company's Lausanne correspondent says:—"A report from Karlsruhe states that a constant stream of British officers is pouring into the prisoners' camp which the German Government has established there as a precaution against the bombardment of the town by Allied aviators. Three flying officers captured recently near Saint Quentin are amongst the latest arrivals."

* * *

It was reported from Zurich on April 25th that travellers from Freiburg state that the effects of the Allies' reprisals raid were far more serious than has been reported.

They say that many large buildings were entirely demolished, including the new university buildings and the new theatre,

and that the main business streets also suffered severely from the bombardment and much property was destroyed.

* * *

A semi-official Berlin telegram relating to the British Admiralty statement regarding the attack by three British seaplanes on five German destroyers between Blankenberghe and Zeebrugge on the afternoon of April 23rd says:—

No damage or loss of life was caused by the enemy machines, which were driven off by our battle one-seaters.

* * *

A German seaplane which is believed to have started out to raid the Kent coast, has been found by fishermen in the North Sea and taken by the naval authorities to a Kent town. It is reported to be a machine of the latest type, and examination showed that it had had to descend on account of engine trouble.

RUSSIA.

OFFICIAL COMMUNIQUÉS.

MAY 2nd.—A squadron of enemy aeroplanes conducted a flight over Tecuciu (an important railway junction in Roumania), and threw about 25 bombs on the town.

MAY 3rd.—AVIATION.—One of our seaplane squadrons threw 120 bombs on Mahmudia (on the Danube in the Dobrudja). Great destruction was observed. Notwithstanding the intense shrapnel fire of the enemy, all the machines and aviators returned unharmed.

We brought down a German aeroplane, which fell in the neighbourhood of Horozanka (Eastern Galicia). The machine and the aviators were captured.

MAY 5th.—Our aviators made a raid on Vilna and dropped bombs on the railway station. Enemy aeroplanes dropped bombs on Stanislaus.

AUSTRIA.

It is reported that the two well-known Austrian aviators, Lt. Souhrada and Lt. Glanz, have been killed. Lt. Souhrada's machine was brought down by French aviators on the Roumanian front, and Lt. Glanz was killed whilst trying a new machine at Vienna.

ITALY.

OFFICIAL COMMUNIQUÉS.

MAY 1st.—Enemy seaplane raids are reported on the Lower Isonzo. Some damage was done.

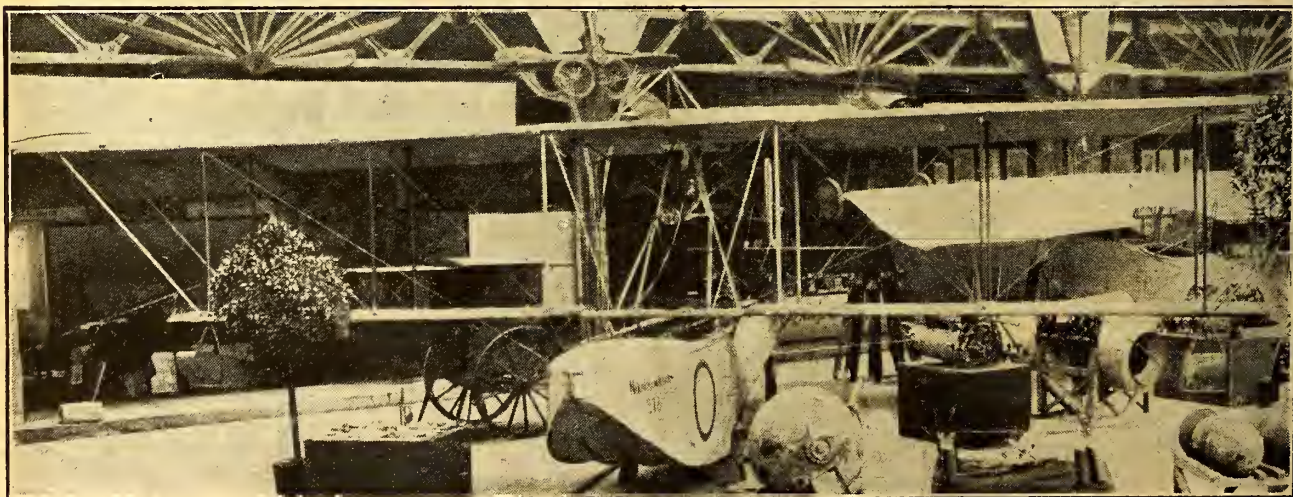
MAY 2nd.—There was considerable aerial activity on both sides. Last night two of our aeroplanes bombed the railway station of Opicina (four miles north of Trieste), and then returned safely to their base.

On the night of April 30th a squadron of six enemy aeroplanes dropped 10 bombs in the neighbourhood of Avlona, but without causing casualties or doing damage.

MAY 3rd.—Last night enemy aviators dropped bombs upon training establishments and dwellings at Codigoro (in the marshes at the mouth of the Po). Some damage was done to buildings, but there was no loss of human life. One of our aerial squadrons renewed its bombardment of military works at Opicina and Prosecco (both north of Trieste), afterwards returning in safety to its base.

MAY 4th.—Last night a squadron of our machines bombed the railway centre near Sesana (10 miles east of Trieste). Hostile aircraft dropped bombs on Fogliano and Sagrado (Isonzo), causing damage.

MAY 5th.—During the night four hostile aeroplanes bombed Gorizia without causing casualties or doing damage.



From a Photograph received from a Neutral Country.

AT THE GERMAN AERONAUTICAL WAR TROPHY EXHIBITION.—In the foreground is seen a Russian Lévêque flying boat. A Parasol Monoplane is behind it to the right, and a Morane Monoplane hangs from the gallery behind. Various engines stand about. Note the decoration of propellers.



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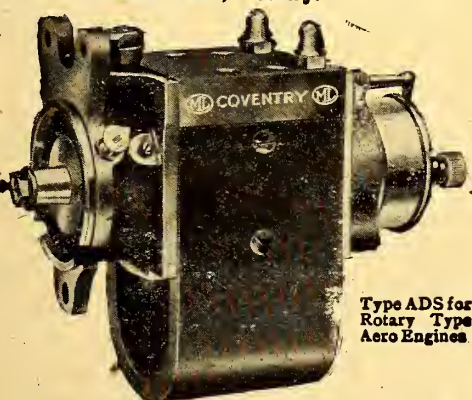
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In preparation for the post-bellie employment of the "eyes of the Army and Navy," now on very active service among the four-and-forty-winds of heaven, a strong committee has been charged with sorting out the various suggested aero-post schemes. The findings of these officers and officials are to be made public within two months from date of the decree. Among the eight men on this job, I note a general and a naval captain, a postmaster general, M.P.s, and two members of the Upper House. Will the 600 Caproni trips end in a mere beneficial parcel-express work? Or shall we return in the wee hours with the breakfast milk in a parachute?

Apropos of fog dispersion by firing mortars (suggested somewhere lately), hereabouts antiquated weapons of the sort are most efficacious in the "shooting" off of the destructive hailstorms common to the Italian May.

* * *

On April 17th, the weather being unsettled, a number of hostile aircraft, supported by torpedo-boats and submarines, approached the naval port of Venice to carry out a reconnaissance in force. A prompt counter-attack by our own and some French aeroplanes, together with the gunnery of our A-A batteries, prevented the attacking force from getting over the city. In the course of aerial duels which took place, some even at a distance from the coast, one of the enemy's machines was brought down. Two of our seaplanes have not returned to the base.

* * *

Details of the recent raid on Freiburg prove that the north portion of the railway station, where an ammunition train was blown up, was destroyed.

* * *

Elisha and Elijah having been attached to the Naval and Military Flying Corps of this country respectively, in the quality of celestial escorts, one is left wondering who is the potent patron saint of the dirigible people. Whoever had this very modern privilege is evidently quite up to his job, however, and a worker in the dark, too, save when the searchlights pick his protégés up.

In plain speech the strafe of 19/3/17 on Galliano was the 50th raid carried out by Italian airships since Italy "joined up."

Some 40 tons of explosives have been dropped, and the Army has only lost one vessel, viz., M.4, announced officially at the time. Her crew, though the vessel was helpless, at a few hundred feet above the enemy, refused to surrender, and the ship was brought down by an incendiary shell as a complete wreck. Being the last of that series no other way out was left, and the sacrifice is all the more admirable.

Another vessel returned from an expedition with over two hundred holes in the envelope, four in the engine casing and forty odd among the rudders and directional planes and fins.

The airship which figured in the excursion to the Opicina station in August last, was much worried by a hydro-aeroplane, which experimented with incendiary bombs, and was finally out-maneuvred by smart piloting and gunnery.

Of the Trento-railway raid, which took place in a snowstorm, and was accounted at the time highly effective, much ought to be said, but cannot. It should be remembered, too, that, as THE AEROPLANE reported in 1914, Italian dirigibles were engaged in mine-hunting in the Adriatic in the interests of their fishing folk thereabouts quite six months before they went in for actual hostilities. It seems that any nation which did not keep all its dirigible eggs in the same basket—and used vessels of various classes—should have a great pull over any of the present day Aerial Armadas. Parliamentary stinginess would have to be guarded against like the plague while things were being got going, though.

* * *

The last eight days of April saw the greatest activity yet chronicled on this aerial front. Apart from the official and semi-official news, which is abundant, the newspapers have been allowed to make known a lot about the doings of our flying friends and brothers.

* * *

Summing it all up, one gathers that if the enemy has greatly improved his artillery, his gunnery has not proceeded at the same pace. On the Italian side, the supply of men and machines seems all that can be desired. The airships seem to be well worthy of their wages, too. For example, that trip to Prebacina on April 24th served another purpose perhaps even better than the ostensible one, viz., the discovery of the new A-A. batteries, and what they are firing. A 105 battery using chain-shot and smoke-trail incendiary projectile seems to be in use. So that the airship had quite a warm time of it and any amount of manœuvring-practice before she returned to her shed.

* * *

Again, a little "strafe-expedition" to Bozen and Meran in the Tirol on the part of two dozen Italian aeroplanes on that same day obtained a wealth of information for the actual strafing which is to take place in the ripeness of time.

* * *

The Minister of War has authorised the holding of an Aero Show at Milan from June 2nd to 17th next. No spy need, of course, bother to turn up there, but the exhibition promises, under the management of the National Aerial League, to be highly in-

structive to the general public, who have, it is felt, been necessarily kept somewhat in the dark as to the progress of aviation during the last few years. The Cloisters of the "Grazio," so permeated with the influence of Leonardo da Vinci, whose studies on wing shapes are a national glory, will, it is hoped, house this Aero Show.

* * *

If my sight has not greatly deuded me, the Caproni biplanes are now showing a distinct horizontal dihedral, V. "arrow," or whatever swept-back wings are called.

* * *

A fatal example of that danger, which will always be with us as long as propellers are, has just come to darken life for me. One who was as a brother to me lost his life last week in a forced landing due to a blade of the propeller flying off and putting the elevator out of action.—T. S. H.

BELGIUM.

OFFICIAL COMMUNIQUÉ.

MAY 4th.—Allied aviators bombarded the German aviation centre of Ghisteltes.

During the night of May 3rd-4th the Belgians, for their part, dropped 1,500 kilogrammes (a ton and a half) of projectiles.

SWITZERLAND.

The special correspondent of the "Daily Express" reported from Geneva on April 26th:—

"La Suisse" gives details of a most serious violation of Swiss neutrality which occurred on Tuesday night, when German aviators, though officially their nationality is unknown, threw bombs at an ammunition factory at Porrentruy, belonging to M. Theurillat.

His neighbouring villa was destroyed, and a man and two children were injured. Swiss troops fired on the aeroplane, but it escaped.

* * *

A message from Geneva on May 4th stated that the Swiss are becoming exasperated by the continuous violation of neutrality by German aviators, who have again dropped four bombs at Beurmesin on the Swiss frontier.

The newspapers demand more energetic measures by the Government.

* * *

It was reported from Berne on May 5th that the French Minister has expressed to the Swiss Government the sincere regrets of the French Government relative to the recent bomb-dropping incident at Porrentruy.

He explained that it was owing to a regrettable mistake that French aviators had dropped bombs over the Swiss town. Suitable notice of the affair is being taken by the French Government, and adequate indemnities will be paid.

The aviator who dropped bombs on Porrentruy destroyed a villa and injured a man and two children.

* * *

Zurich learnt on April 18th that a German aeroplane appeared over the neighbouring valley of Limmat and proceeded on its way rejoicing. On perceiving that someone was aiming things at it the pilot decided—one never knows one's luck, or rather the other man's—to alight; which manœuvre was effected without hurting anything near Lucerne (?) No harm had, of course, been intended, it was merely the weather which had been horrid.

* * *

A triple violation of the Swiss frontier was effected by Hun aeroplanes recently. Five of that nation's machines flew over Bale at a great height on April 18th, in the morning, coming from the Burgfelden way. Later in the day another one flew over from the direction of Rheinfelden. Lastly, a German machine came down near Döttingen and was captured with its crew. It is presumed that all this has to do with the allied raid on Freiburg.—T. S. H.

HOLLAND.

It was reported from Zierikzee (Zeeland) that on April 30th an aeroplane threw five bombs on the town at 2.15 a.m. Three persons were killed. Five houses were set on fire, and over 100 others were damaged. An enormous number of windows were broken, and the material damage is great.

TURKEY.

OFFICIAL COMMUNIQUÉ.

MAY 7th.—PALESTINE FRONT.—Six of our aeroplanes most successfully dropped several bombs on the enemy headquarters, and on one of his aerodromes.

BULGARIA.

OFFICIAL COMMUNIQUÉ.

MAY 7th.—Sub-Lt. Burckhardt brought down an enemy captive-balloon east of the Tchernia.

GREECE.

On the night of March 31st two Greek aviators attached to a British aerodrome in the Aegean made a raid on the district of Drama and dropped many bombs from a height of five or six hundred feet on the aerodrome and the railway station.

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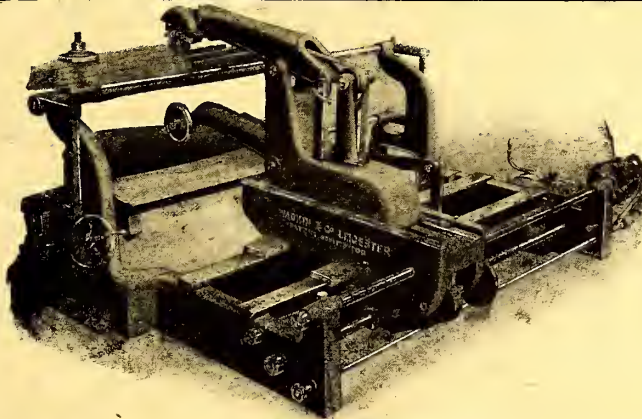
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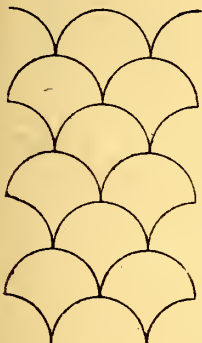
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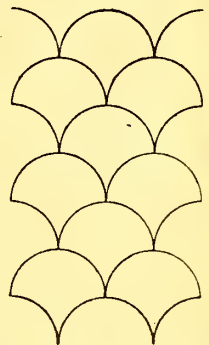
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METEOROLOGICAL CONDITIONS.

On Wednesday, May 2nd, a meeting of the Aeronautical Society of Great Britain was held at the Royal Society of Arts, when Capt. C. J. P. Cave, R.E., read a paper entitled "Some Meteorological Conditions which increase the danger of Flying." Major Lawrence was in the chair.

It is rather a curious matter of observation that the lectures given before the Aeronautical Society are not attended by those who should be practically interested in the subject under discussion. One might have hoped that the hall would have been filled by pilots in the R.N.A.S. and in the R.F.C. and by a large number of Probationary Flight Officers, R.N., and Cadets, R.F.C., eager to learn something new about the conditions under which they have to fly, considering that so many of these gentlemen are within easy reach of London.

Strange though it may seem, there was not a single flying officer from either Service present. In fact, so far as the writer of these notes could see, the naval and military congregation consisted of three sub-lieutenants, R.N.V.R., one Staff officer, one observer, R.F.C., two equipment officers, R.F.C., one infantry officer, and one infantry private.

One can forgive the absence of active service pilots, but the entire non-appearance of the many novices, who are learning to fly within an hour's drive of London, is only explained by the curious notion possessed by the average youth who has had five minutes' training in a school machine that he knows all there is to know about flying and all that is related thereto. One ventures to suggest that the Naval and Military authorities would do well to send parties of those under training to those lectures which are most likely to be of educative value to them.

There can be no doubt, however, that the civilian audience thoroughly enjoyed the lecture, which was clear and to the point, eminently practical and unobscured by that species of diagram which is only understood by its perpetrator and not always even by him.

Capt. Cave opened his lecture with a protest against a rather common impression that so much progress has been made in aviation that one can afford to disregard the weather altogether, except, perhaps, in the case of fog. Although a seaman puts to sea in almost any weather the toll of shipping is a proof that seamen cannot entirely disregard meteorological conditions, and aviators are naturally no more immune.

The chief conditions that may increase the risks of flying are:—(1) gales, (2) squalls, (3) bumps and eddies, (4) clouds, (5) rain, hail and snow, (6) fog, (7) lightning.

Capt. Cave discussed these varying conditions in succession. As regards gales. Flying in strong winds is less formidable than it was some years ago, but even now gales may rise with great suddenness and sometimes without much warning. On Sept. 28th, 1914, a barometric depression formed over the Bristol Channel and passed over the south of England doing considerable damage, and a velocity of 80 m.p.h. was recorded when only a quarter of an hour previously it had been quite calm. Fortunately, the incident happened late in the evening, and there is no recorded instance of an aviator being caught. As a general rule, however, gales may be predicted many hours in advance.

A squall is a temporary rise in the wind above the mean velocity which precedes and follows it. The rise in the velocity being continued over some minutes at least, is thus distinguished from a gust, which lasts only a fractional part of a minute. Squalls are generally experienced with the travel of large cumulus clouds and their approach can be observed, especially at sea where the water is disturbed. Squalls of great intensity are associated with thunder storms and are frequently experienced after a period of dead calm.

One special species of squall is known as a "line squall," which may be some hundreds of miles long and which advances across the country broadside on at a rate of 20 to 40 miles an hour. The sequence of conditions in a line squall is somewhat as follows:—A bank of clouds is seen extending along the horizon of great length and uniform height and very dark below. It usually extends from horizon to horizon, but owing to the effect of perspective it appears like an arch in the sky, and as the cloud reaches the observer a violent squall springs up. The wind veers rapidly or even suddenly, rain falls in torrents, and there may be hail, thunder or lightning. The temperature falls rapidly—often as much as 20 degrees. The depth of the squall from front to back is seldom more than a few miles. Such squalls are extremely dangerous to aviators as it is, of course, impossible to fly round them owing to their great length, and it is not always possible to fly above them.

[Old members of No. 2 Squadron will doubtless remember an extraordinarily skilful landing made by Capt. (now General) Longcroft in a line squall at Montrose some years ago, when he was only able to hold his machine from being blown backwards by keeping the engine running all out, and actually held it on the ground by that means till his mechanics were able to catch hold of it.—Ed.]

As, however, such squalls progress steadily across country it should be quite easy to give warning of their approach by pro-

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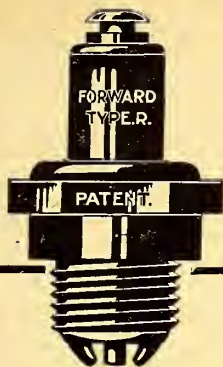
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perly arranged system of signalling of meteorological observing stations. That there is time for such warning to be given was shown by the fact that a telegram was received at Farnborough from Upavon stating that a line squall had passed over. Despite the comparatively short distance, the telegram was received about 10 minutes before the squall reached Farnborough, and naturally messages sent from stations at a greater distance would give more time for the necessary precautions to be taken.

The lecturer did not deal at length with bumps and eddies as he felt that pilots were better qualified to speak of such phenomena than meteorologists who had only been taken in the air a few times as passengers.

Clouds may be of danger in several ways. In the cumulus clouds heavy rain, hail or snow in winter may prove extremely dangerous. Such clouds are of great extent and are the seat of very rapidly ascending air. The pilot might easily lose his bearings in such a cloud. Low lying sheets of cloud also made navigation difficult, and on occasion clouds were so low as to make the actual operation of landing hazardous.

The danger arising from snow and hail varies from discomfort in the case of light falls to real danger in the case of heavy falls. The lecturer showed a photograph of hail stones which had fallen in Essex on May 27th, 1914. Although they had partially melted when the photograph was taken they are still nearly as large as a hen's egg that was photographed then for comparison. Birds and small animals were killed and injured, and corrugated iron sheets were penetrated. The effect of such projectiles upon an aeroplane could well be imagined.

Fog is, perhaps, one of the worst dangers that are encountered in flying. The lecturer did not deal at length with this subject as it had lately been dealt with by Major Taylor.

It is difficult to say what is the danger to be apprehended from lightning as such. The dangers from thunder storms are due to the squalls and to the heavy rain accompanying them. The actual danger from lightning to an aeroplane flying through a thunder storm might not be more than that incurred by a pedestrian walking over a common during a storm. A pilot who was flying above a thunder cloud reported that sparks were given off from his machine at intervals. It was likely that this happened every time there was a thunder clap below him.

Lightning was also a danger to kite balloons owing to the conducting wire. There were several cases on record when meteorological kites have been struck by lightning, and as some of these occurred when there was no thunder storm in progress it must be remembered that clouds may be highly charged with electricity at times when no actual storm is in progress.

The lecturer said if he felt he could persuade aviators to take

meteorology more seriously, he would feel that he had not read the paper in vain. Those who are responsible for the safety of aeroplanes and airships ought to know as much about the weather as a master mariner in the Mercantile Marine.

In opening the discussion the chairman pointed out that important changes in weather conditions were often connected with very small changes in meteorological phenomena and were sometimes prone to slip through the chain of meteorological stations. He recommended a complete organisation of observation posts all over the country, which could signal the approaching change in wind and cloud formation to a central clearing house, in order that the various aerodromes might be thoroughly posted.

Sir Napier Shaw, the eminent meteorologist, said that pilots had a splendid opportunity of adding to the knowledge about the weather. He said that it was rather extraordinary that man who claimed to be a superior being knew far less about the weather than any animal, including even the despised ass. He did not, however, wish to infer that man was actually inferior in intellect to this quadruped.

Mr. Bertram Cooper said that the unsatisfactory knowledge of meteorology among aviators was very largely due to war conditions. The Service pilot had to take great risks in the performance of his duty and had to take the weather very largely as he found it. In peace time he was sure that pilots would give the weather much more consideration, especially with a view to the development of commercial aviation, when it would be necessary that weather conditions should be studied with the greatest care.

Mr. Humphreys asked about the effect of gun fire in France upon the recent inclement weather conditions. He said that he had observed that during the recent big pushes there had been heavy rain storms and remarkable falls in temperature. He suggested that the concussion of gun fire created rising currents of air which resulted in falls of temperature and consequent storms.

Capt. Cave, in replying, said that as regards line squalls he did not know at what height they would not be experienced. Gales of increasing velocity are experienced at a height of five or six miles. Thunder storms might be met at 24,000 ft.

As regards gun fire, he thought that if this really had any effect, rain must fall over the front all the time. He did not think that everybody realised how enormous were the forces which went to establish weather conditions, and he did not think that any effort we could make with artillery and the like could have any appreciable effect on the weather.—W. L. W.

[In support of which view one may recall that during the latter part of 1914, when the war began, and the heaviest gun fire the world had known up to that time was in constant being, the weather was unusually settled and fine.—Ed.]

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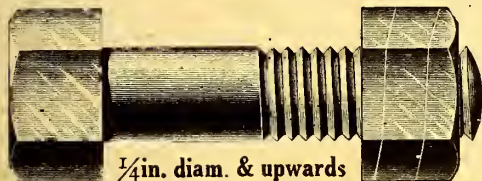
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ANSWERS TO CORRESPONDENTS.

On account of the labour involved in replying to questions from correspondents, many of which in the past have been answered over and over again by post, it has been decided to answer inquiries of general interest in the columns of THE AEROPLANE. Inquiries should be addressed to The Editor, 166, Piccadilly, W.

READERS BY THE HUNDRED.—If you want any information about joining the R.F.C., write to the Director-General of Military Aeronautics, Adastral House, Blackfriars, E.C.

If you want any information about joining the R.N.A.S., write to the Air Department, The Admiralty, Whitehall, S.W.

D. D. M. (Newcastle-on-Tyne).—If you qualify for an Aero-Club certificate it would certainly be to your advantage in the Aircraft Industry. If, under the new Military Service Act, it were found after about twelve months that you were fit again and so had to rejoin the Army, the possession of a certificate would probably be very much in your favour in applying for a Flying Corps commission. There are at the moment many civilian pilots for test work, but possibly some of the big firms after the war will need more pilots for demonstration purposes, and it is possible, therefore, that if you remain with your present firm and obtain a certificate at your own expense they might be more inclined to give you a job as a pilot than to engage somebody from outside. The mere possession of a certi-

cate would not guarantee your getting a job of greater value than you hold at present, but it would undoubtedly help you towards such a job.

F. H. (B.E.F.).—Henry and Maurice Farman are brothers, and there is a third brother called Dick (not Richard). Henry and Maurice Farman designed their own aeroplanes, both starting with the early Voisin as a pattern and developing their own ideas, but combined forces in 1912. A recent production of the Farman firm, known as the "Horace," is a combination of Henry and Maurice Farman machine, the wings and tail being reminiscent of the Henry, and the nacelle of Maurice type.

L. F. F. (Leeds).—It would really save quite a lot of trouble to yourself and others if you would follow the advice in the first paragraph of "Correspondence." Probationary Flight Officers, R.N.A.S., and Cadets, R.F.C., are supposed to have a respectable education. All particulars as to the form of examination, pay, etc., can be obtained by applying to the proper quarters. A knowledge of telegraphy is useful in any of His Majesty's Armed Forces, and in several occupations which are unarmed.

W. M. (Tottenham, N.17).—Your defective vision makes it almost impossible for you to obtain a commission as a Flying Officer, and in view of your youth you are not likely to be granted a commission as an Equipment or Non-combatant Officer associated with flying unless you have been placed in a low medical category. If, however, you have been classed B or C it might be worth your while to apply for a commission as a Stores Officer, R.N.A.S., or Equipment Officer, R.F.C. It might equally be worth your while to apply to the Air Board for an appointment as a civilian draughtsman if you are not liable to general service.

G. A. M. (Stamford Hill).—It is difficult to tell you where you can obtain a model aeroplane motor for the sum of £2 in these expensive days. You might, however, try Messrs. A. E. Jones, 97, New Oxford Street, W.C.1, they may be able to help you.

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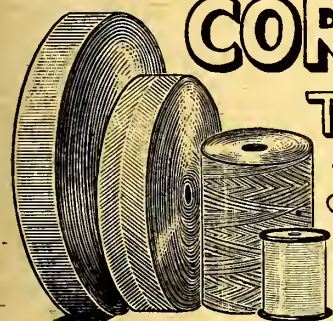
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T. N. (Westminster, 1).—See the first paragraph in "Answers to Correspondents." Your best course would be to apply to be taken on as a Boy Learner.

H. H. (Bristol).—An excellent handbook on the Renault engine can be obtained from the Wolseley Motors, Ltd., Adderley Park, Birmingham, who manufacture the Wolseley-Renault engine under licence.

G. C. G. (Fulham).—Your best course would be to apply to the Department of Military Aeronautics, Admiralty House, Victoria Embankment, E.C., and inquire about the conditions relating to the employment of women car drivers for the R.F.C. These ladies are certainly paid a salary, but I do not know whether voluntary workers are accepted.

Lower Deck.—The only way whereby an enlisted man in the Navy can transfer to the R.N.A.S. or the R.F.C., with or without commissioned rank, is by the personal consent and influence of his immediate commanding officer. At the present time, unless circumstances are exceptional, it is impossible to spare any ratings for flying work.

A. E. M., R.F.C.—I take it all observers have to pass some definite test before getting their single wing, but if anybody you know as an observer has the regulation double wing, it obviously means that he has become a pilot. Whatever may be the case, a number of N.C.O. observers wear a single wing, though whether it is given to them as a reward for good service abroad, or whether they have to pass some particular test for it, I do not know.

The kite-balloon people wear a different badge altogether.

I have heard of one case in which an N.C.O. observer was personally presented with his observer's wing badge by his C.O.

H. H. B. (Stockton-on-Tees).—Questions of this nature must be addressed to the Department concerned. See first paragraph at the head of "Answers to Correspondents."

A. S. V. (Tonbridge).—It is quite impossible to determine whether you will be accepted as a candidate for the R.F.C. Your only course is to write to the proper Department and find out.

E. J. N. (Montpelier, Bristol).—Your first point is a matter which can only be settled by the Department of Military Aeronautics. In the ordinary way, if you were found unsuited for the rank of Flying Officer you would probably be transferred to an Infantry commission, or to the ranks, according to the circumstances.

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THE AEROPLANE

WEDNESDAY, MAY 16, 1917

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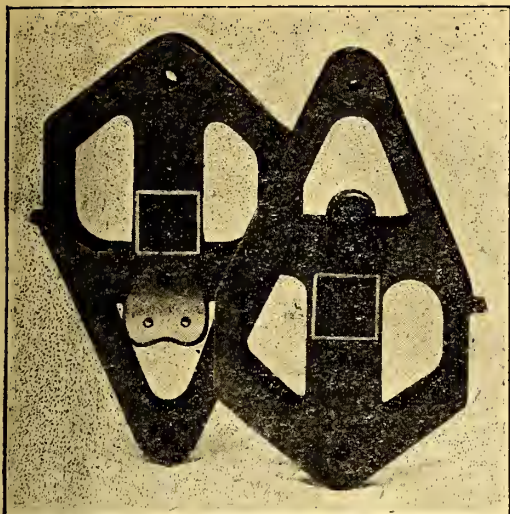
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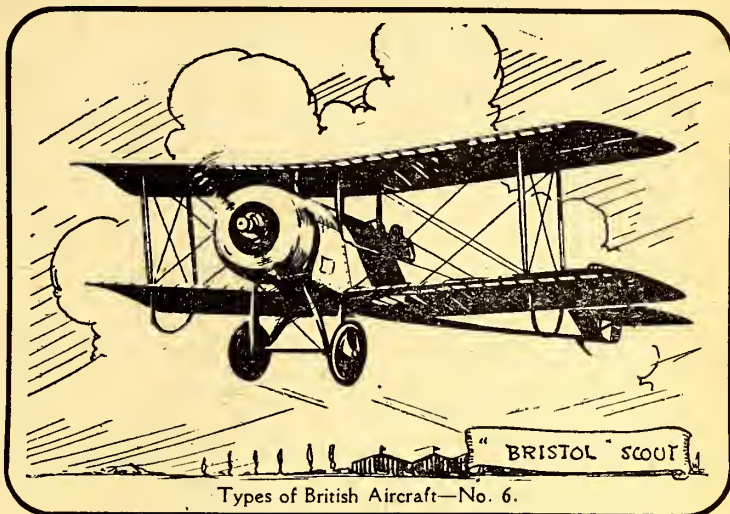
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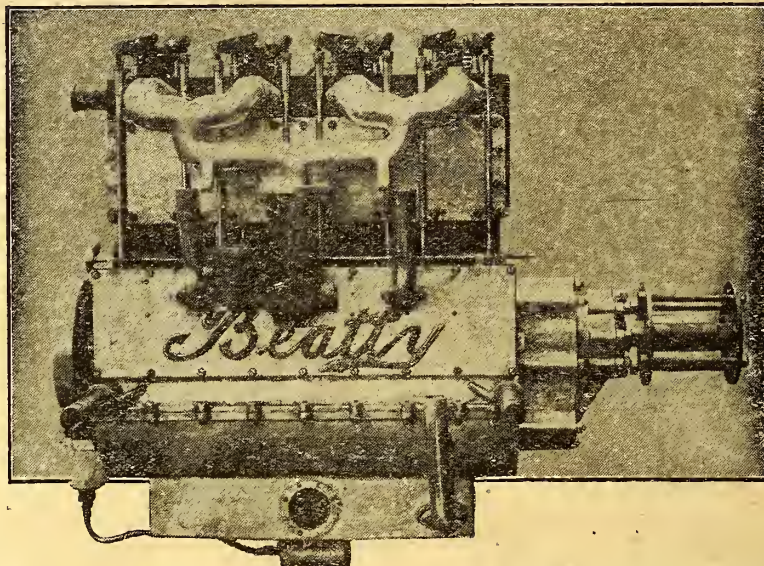
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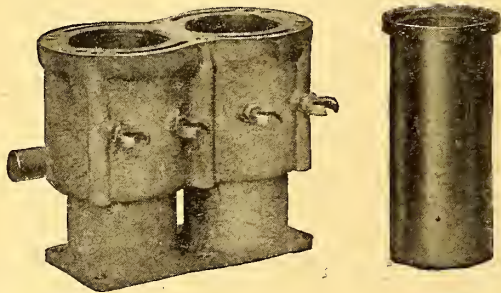


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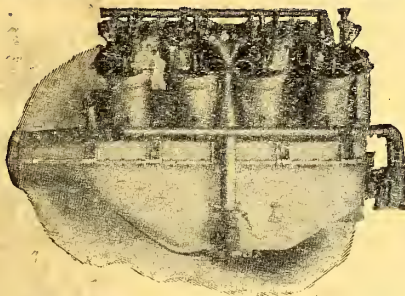
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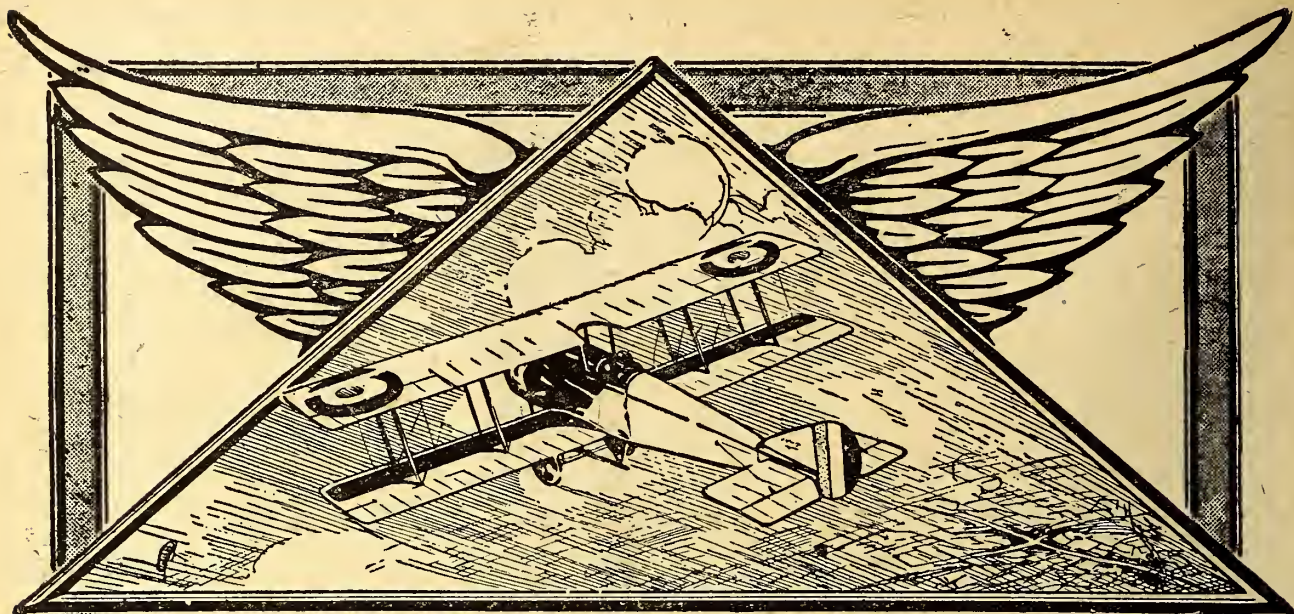
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ON SOME MORE POINTS FOR THE AIR BOARD.

It may be assumed as a postulate that we all wish to win this war as soon as possible, at as small an expense as possible. Also it may be assumed as an axiom that we have in this country the best pilots and the best aeroplanes in the world, and that if we can produce enough of both the war will thereby be shortened and the consequent expense reduced. Therefore it may be assumed as a problem that our task is to produce the maximum number of the best pilots and the best aeroplanes in the minimum time and at the minimum expenditure of labour, material, and time.

So far as the production of pilots is concerned, this portion of the problem seems to be in very good hands. There may be, in fact there certainly are, weak spots here and there, owing to the fallibility of the human animal, and in consequence one finds one training establishment doing extremely well and another very badly. But as each such establishment is in competition with others of a similar kind, there is direct competition between one and another, so that those in authority can judge by results, and reform or reorganise any training centre which is not producing pilots in the required quantity or of the desired quality. Competition finds out the weak spots, and makes it possible to trace down the reason for weakness to its source. In fact, the old proverb, "Competition is good for trade," holds good here as in ordinary commercial life.

When, however, one comes to study the question of the supply of aeroplanes, the position is not by any means the same. It is true that there is competition between one firm and another where both are making the same class of aeroplane or engine, and so it is possible to find out why one firm is turning out less of one type than another, but such competition is not free commercial competition as in pre-war days, because every manufacturing firm is entirely under Government control in practically every essential matter.

SUPER-CONTROLLING.

Labour is controlled, more or less, but less than it should be in one direction, and more than it should be in certain others. Profits are controlled, very much more than less, and in a way which certainly does not encourage production—but that is another story of which much may be said later. Machinery is controlled, with absolutely dire results in many cases, as anyone may discover who takes the trouble to talk to manufacturers who know where they can get just the machinery they require by simply sending to fetch it, but have to wait weeks for an official release-note before the maker or dealer dares to hand it over to them. Material is controlled, with equally disastrous results, owing to delays in getting multitudinous documents through a maze of departments staffed largely by people who know little or nothing about the business in hand. And design is

controlled, with perhaps rather less ill effect than most other departments of production, though here again one is apt on occasion to meet the old familiar official who is at once the judge of and a competitor with the independent designer.

The thing over which there appears to be least control is the amount of controlling which may be done by any controller, sub-controller, or acting-sub-assistant-deputy controller. Some control is good for capital and labour in any industry, much on the lines of the philosophy of the late Mr. Artemus Ward, when he said: "Some fleas is good for a dog. They prevents him from brooding on the fact that he is a dog." But controllers, like fleas, can be overdone. The dog may spend so much time scratching that he has no time to bite burglars, and an industry may have so many controllers and inspectors and checkers and supervisors and so forth that it has neither the requisite amount of time nor of labour to enable it to reach its greatest possible output.

THE WHY AND WHEREFORE OF THE AIR BOARD.

Now, the Air Board was appointed by a much-badgered Government to organise and increase the supply of aeroplanes. One may leave airships out of the argument, because the big rigid airships are not under the Air Board, and the smaller ones really consume so little labour and material, compared with the output of aeroplanes, that they do not affect the argument, and, anyhow, whatever is said about the supply of aeroplanes applies in a general way to the smaller airships.

Undoubtedly the output of aeroplanes and engines has increased greatly since the Air Board was appointed, but it still remains to be seen whether it is so *post hoc* or *propter hoc*. There are those who will argue that the present increase is due to the energy and organising power of those who did the work and put the system of production in train before the present Board came into office.

Possibly they are right. Personally I know that several people connected with the supply department of each Service who ought to have been gently but firmly removed many, many months ago are no longer concerned with supplies. But I also know that sundry others who ought to have gone long before them are still in office, and that others have been promoted who ought to have been demoted. On the other hand, it must be freely acknowledged that some appointments of high excellence have been made, not merely to the extent disclosed in Major Baird's speech last week, but in minor positions also. Taking it all round, so far as one can see, the changes made by strictly Naval and Military appointments to positions concerned with supply of aeroplanes, and to those concerned with design, are almost all distinctly in the right direction. Perhaps one cannot say as much about the appointments of

civilians in uniform, or of purely civilian officials, which is another matter, but one cannot expect perfection all at once.

Everyone in the Services and in the Industry who has come personally in touch with Lord Cowdray, the Chairman of the Board, has the highest respect for his earnestness of purpose, and the greatest confidence in his desire to justify the Board's existence by increasing still further the output of aeroplanes. The increase of output constitutes the whole why and wherefore of the Board's existence, and the confidence thus indicated is the happiest possible augury for the Board's success.

It is the earnest hope of all concerned for the welfare of the Flying Services that the Air Board may succeed, and it is in the hope of assisting towards that success that I venture to set forth hereafter some of the pitfalls into which the Air Board may tumble if its members are not careful about their future policy.

THE DANGER OF ANARCHY.

I take it that to most thinking people in this country the great national danger at the moment appears to be the danger of anarchy. Not the danger of revolution, if you please, but the danger of sheer lack of government, owing to so many Government officials being appointed, all without knowledge of governing, that they become so tangled up in one another's work as to be incapable of producing that law and order which is necessary to the efficient prosecution of the war. The result appears to be a state of affairs which may best be described as a kind of immature and amateurish Socialism. In this direction lies the first and chief danger to the success of the Air Board.

Before the creation of the Air Board the Contracts Departments of the two Services and the Aeronautical Inspection Department, R.F.C., did useful work in helping firms who were new to the Aircraft Industry to procure parts which they could not make themselves. Also, they assisted firms in allied industries who had set out to make aeroplane parts in getting into communication with aeroplane constructors who needed such parts.

Later on, when at Adastral House, the R.F.C. instituted a system of "Urging Orders." Wounded or invalided officers were sent round to discover why certain supplies on order had not been delivered, and in similar ways did the work which is done by men commonly known as "chasers" in commercial firms. Quite a considerable amount of good was done in this way.

THE NEED FOR SPECIALISTS.

The principle involved was excellent, and might still be developed with excellent effect by a thoroughly good organiser. But such a man would have to be a first-class business man, with vast experience in dealing with complicated details. The right man, with plenty of money, accommodation, stationery, and office organisation at his disposal, could become a public benefactor. He would split his job up into several departments, with a live business man at the head of each. In most of these departments the chief would be a trained buyer. One of them would be well versed in dealing with manufacturers of repetition machined parts, another familiar with sheet metal production, another who knew the Sheffield and Birmingham metal trades inside out, another a trained specialist in timber, and so forth. And each man would attend to his own trade and no other. Such a man would command the confidence and respect of the Aircraft Industry and all its ancillary trades.

This method of controlling and expediting supplies through specialists in different trades seems fairly obvious, but it does not appear to have been tried, either

at Adastral House or at the Hotel Cecil. And, be it noted, there is a vast difference between the specialist and the "expert," once so deliciously diagnosed by General Henderson.

Too often in time of peace the "expert" only holds a Government job because he has not enough ability to secure a position in an ordinary commercial firm, and in war-time the expert in uniform is sometimes in uniform because he cannot earn a living in plain clothes. Which regrettable state of affairs seems to be borne out by the fact that there are cases on record of really able men who got into uniform early in the war in a highly patriotic spirit, and got out again later on because they found that they could better serve the country as civilians in a still higher spirit of patriotism. This does not give one any overwhelming confidence in the judgment of experts in uniform, especially when they are concerned with problems of supply or production.

AN IMPORTANT DIFFERENCE.

One must be careful, however, to distinguish between such civilian experts temporarily in uniform and *pukka* Naval and Military officers who are specialists in design and construction of aeroplanes because of their knowledge dearly bought in the bitter school of active service, though one may safely class with these civilians a limited number of Service people who have strenuously avoided expanding their knowledge at the cost of experience in actual war.

It is encouraging to find that under the new régime quite a number of pavement warriors are being sent abroad to expand their minds, and possibly to mortify their flesh, for mere common sense enables one to understand that only active-service aviators can judge what is fit for use on active service. And conditions on active service change so rapidly that if one loses touch with such conditions for even a few weeks one's ideas become absolutely out of date. A dose of experience abroad would do a power of good to many of the uniformed civilians whose work during the war has seriously retarded the output of much-needed aeroplanes.

Let us, however, return to the practical question of increasing output in the future, instead of discussing those persons who have diminished output in the past.

HASTENING SUPPLIES.

The function of the Air Board is evidently to increase output by assisting aeroplane constructors and suppliers of parts. It may legitimately urge orders forward and chase supplies, but surely its first effort should be so to arrange things that manufacturers can obtain supplies of material with the greatest possible dispatch.

When a contract goes out for a quantity of B.F.2s—of officially standardised design—or of, say, Handwith fighters, the Air Board's job would seem to be to arrange for the firms who are to make the machines to get their parts as quickly as possible, and for the makers of those parts to get their raw material as quickly as possible. Sub-contractors for wings, for instance, must have their timber, and metal clips, and nuts and bolts, and wire at once. And the makers of metal clips and nuts and bolts must have their raw metal.

That, however, does not seem to be the method of the Air Board, some of whose officials apparently aspire to be buyers, wholesale suppliers, storekeepers, and retail shopkeepers, all rolled into one. Such a task would demand organising capacity of the kind possessed, say, by Mr. Selfridge, or the General Manager of Harrods, or of the Army and Navy Stores, which certainly does not appear as likely to be found among the members of the second-hand motor-car trade who have drifted into the stay-at-home jobs connected with the Flying Services. If one understands aright the methods at

present being adopted, they seem more likely merely to hold up output.

At any rate, people in the Trade are being afflicted with "Instructions as to Placing Orders," "Instructions as to Urging Orders Placed," "Instructions as to Material Required in respect of which Orders are. Refused," besides letters concerning the placing of orders direct for stock by the Air Board. All this would perhaps be quite good if administered by picked business men, but one has grave doubts whether it will work out in practice.

PLACING ORDERS.

One gathers that many firms have been instructed to send details of their requirements to the Air Board, who will tell them where to place their orders, or alternatively to send to the Air Board copies of all orders which they have themselves placed.

Apart from the fact that contractors are told in one paragraph not to place orders themselves, and in another to supply copies of their orders, which appear to be contradictory instructions, the scheme seems workable, in so far as the Board intends to supply new-comers with the material they require, or, on the other hand, to urge forward orders already placed. But in practice curious things happen.

For instance, I am told that a certain firm ordered a supply of nuts from a manufacturer with whom they habitually dealt. The said nuts were delivered in a few hours. Some ten days later the nut-maker heard from his customers that they had been instructed by the Air Board not to place the order with him, but to send it somewhere else. The nuts, having been delivered over a week before, had probably been used, but if they had not been delivered so promptly one presumes that the people who wanted the nuts would have been kept waiting for ten days while the Air Board made up its mind who was to be permitted to supply the nuts.

And as one cannot erect an aeroplane without nuts and bolts, presumably the aeroplanes for which they were required would have been delivered ten days later than they would have been if the nut-maker had not, in his innocence, disobeyed the Air Board's injunction as to supplying without instructions. A difference of ten days in the date of delivery of a certain number of new aeroplanes at the Front may make all the difference between an equal number of pilots and their passengers having to fight a big battle such as that at Arras on old machines or on new ones. Which is likely to make

all the difference between the appearance of their names in the Casualty List or in the Honours List.

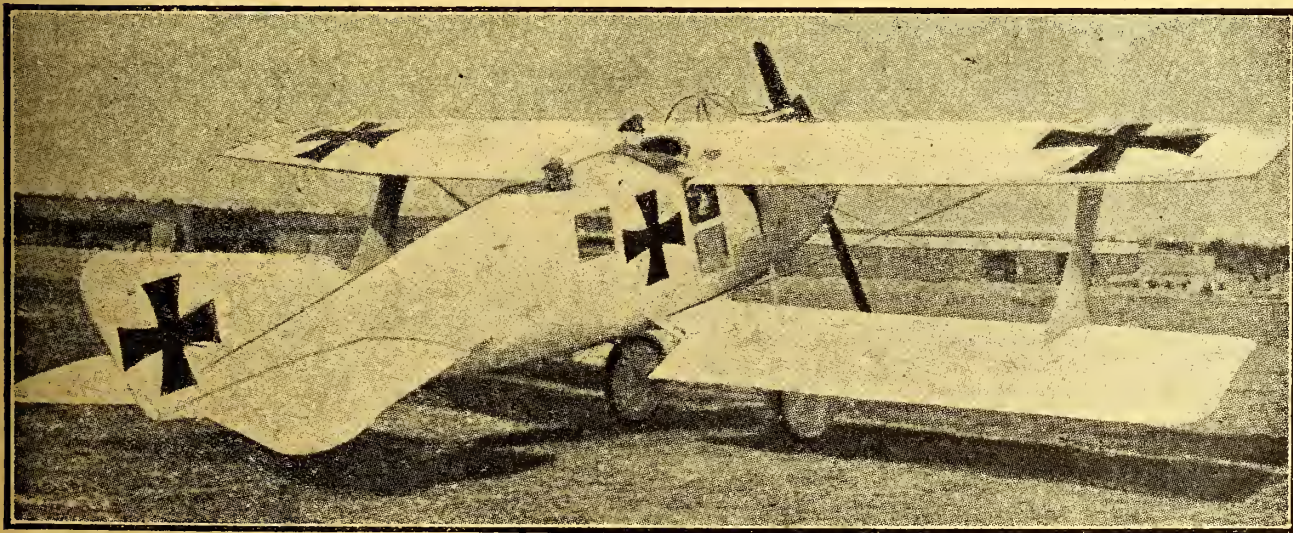
Possibly the young gentlemen who are reorganising—some people will call it disorganising—aeronautical supplies, not having flown on active service themselves, do not quite appreciate that elementary sequence of facts.

THE ART OF BUYING.

Though the estimable gentlemen in high places on the Air Board are reputed to be eminently successful business men, it may be permissible to point out to them that the buyers for the big aircraft firms and the managers of smaller firms, who do their own buying, probably know just how and where to buy material rather better than do the minor officials under the Air Board. Some of the aforesaid buyers are paid quite large salaries because of their knowledge of sources of supply, and it seems a trifle absurd to turn these men into mere clerks with nothing to do except fill in Air Board forms or send in requisitions for parts to the Air Board, while a quantity of young men, quite without experience of sources of supply, though doubtless of the highest moral character, struggle manfully to do by sheer weight of numbers and multiplicity of official documents just what any one of the said buyers could do with a typewriter, a telephone, and a few telegraph forms.

This is an example of the kind of amateur Socialism which is so irritating to business men who know their business. There might be something to be said for a whole-hearted Socialism which would commandeer all supplies and sources of supply, and would then conscript all the experienced buyers of all the firms, and set them to organise the allocation of those supplies to the various manufacturing firms—which would then become Government factories with conscripted labour and conscripted management. But the present system is neither free labour nor conscription, and only seems to point to uncommercial anarchy.

If it is absolutely necessary to place the whole of the buying for the Aircraft Industry in the hands of a Government Department, it can only be on the assumption that producers of raw material or of parts, who have specialised on aircraft production for years, are incapable of deciding, when they receive an inquiry, whether they can supply the goods within a reasonable time or not, and that such firms cannot be trusted to give a delivery date with reasonable accuracy.



A curious Roland two-seater Biplane, with pilot and passenger above the Upper Plane. It will be noted that the "single strut" idea is not new in Germany. The engine is a 160-h.p. Benz. Its body arrangement recalls Mr. R. F. Macfie's design of 1911.

COLLECTING STOCKS.

There also seems to be an idea in circulation that the Air Board is trying to collect or commandeer into its own stores stocks of parts commonly used in aeroplanes. If this is the intention, it would be interesting to know how manufacturers of parts or material are to keep promises of delivery already made to firms who are building aeroplanes, and how aeroplane-makers are going to have any idea of when they will be able to deliver their machines?

There are said to be already instances of firms who have sent inquiries to a producer of raw materials, and have been informed that they cannot be given a date for delivery because the Air Board is thinking of placing an order for all the output of that producer.

In despair the firm has gone to the Air Board, and has been told to go and get their material from the very same producer who had turned them down in the first instance. The result has been pure waste of time, without any advantage to anybody.

UPSETTING CREDIT.

A possible, even a probable, example of another effect of the system may be thus: A firm asks the Board for material, and is told to go to a certain producer with whom they have never dealt. The firm has to pay the price the producer demands, which is probably more than that at which they can buy from producers from whom they have always bought. In addition, being strangers to the producer, they are expected to pay cash against *pro forma* invoice.

How many of even the biggest firms could afford to pay cash before delivery for all their purchases? Think also of the all-round delay. Instead of sending their order to their usual producer, getting delivery in reasonable time and paying for the stuff in the usual course of business, the firm goes to the Air Board. After certain official delay they are told to order from a different and strange producer. After more delay a *pro forma* invoice comes along. The cash is sent—perhaps. And then the firm have to wait without either money or material till the Air Board has time to do some urging and chasing on their behalf.

URGING ORDERS.

It appears that under the new system firms must not send their representatives to the works of producers whose deliveries are overdue, but that the chasing must be done by Air Board officials. Formerly a firm would have sent an intelligent clerk to hurry things along, or in an extremely bad case would have asked the Air Department, Admiralty, or Adastral House to send a special note to the producer to hasten deliveries. Now, however, it seems that a mass of official machinery must be set in motion. And masses of official machinery, as we have all learned from bitter experience, mean hordes of officials and clerks, all new to their work, and increasing quantities of documents and forms.

It appears, nevertheless, that a firm in need of material is permitted, as an act of grace, to write to the producer to suggest mildly that certain stuff on order is really needed, and that it would be a good idea to send it along. But it is strictly *verboten* to send a clerk to sit on his doorstep till the material is delivered—as was the custom which has proved so successful for some centuries. A uniformed official may possibly accelerate deliveries, but it is by no means certain that he will always accelerate them in the right direction—and in any case it would be unbecoming of his uniform for him to be so insistent as an ordinary commercial representative can be.

HOLDING UP DELIVERIES.

One effect of the proposed formation of official stores by the Board must of necessity be the holding up of deliveries by big producers. Presumably firms like Guest, Keen & Nettlefolds, of Birmingham, or the Auto-Machinery Co., of Coventry, who have for years been makers of screws and nuts and bolts and such things, must even to-day have big stocks in hand. It would be interesting to know whether they are at liberty to supply aeroplane and aero-engine makers with the material they need, or whether they can only supply to the Board.

Another point is that, unless orders for stock are placed by the Board with the most intimate knowledge of the requirements of all manufacturers, and are then apportioned with the greatest skill, the Board will find its stores chock-a-block with tons of parts or fittings which nobody wants, and empty of parts which are badly needed.

If parts are ordered for contracts actually in hand, the machinery of the parts-makers is being put to good use; but if the parts are ordered for stock, it is quite likely that some brilliant official may insist on a firm taking its machinery off the production of stuff that is badly needed in small quantities and putting it onto producing in huge quantities stock parts which may or may not be wanted, and may be out of date before they are half-used.

I am told that instances of this nature have already occurred, and the Board will be well advised to study carefully the way in which their subordinate officials are handling such questions, for the accumulation of stock at the expense of holding up deliveries of parts immediately required is the surest possible way of preventing that continuous supply of the most up-to-date aeroplanes which Sir Douglas Haig demanded last December.

OFFICIAL DIFFICULTIES.

One quite recognises the difficulty of organising in a few weeks the supply of material for a huge industry like that concerned with aircraft construction, and therefore it would perhaps be unfair to do more than indicate mildly, as has been done hereinbefore, some of the directions in which things seem to be going, or likely to go, wrong.

Doubtless Sir William Weir, the Controller of Aeronautical Supplies, can find many specific instances on these lines if his duties permit him time to investigate. He will doubtless recall a very brainy effort made in the North, quite early in the war, to organise from a group of firms an output of some hundreds of aeroplanes per week of a certain type, and he will doubtless be able to verify for himself a statement made to me recently that after well over a year's striving the output had not far exceeded ten per cent. of the projected figure.

Fortunately other manufacturers who were not favoured with so much official assistance managed to keep the Flying Services fairly well supplied with machines, but one hopes that the object-lesson afforded by that effort at official control may provide him with some examples of what to avoid. If, however, he or the Air Board as a whole want further examples of official errors, it is possible to find them in plenty inside the precincts of the Hotel Cecil. So far I have merely indicated the general lines along which mistakes occur, or are likely to occur, of such a nature as to prevent the maximum output of aeroplanes. I have not touched on specific instances, or on the engine question, but there is plenty to be said on those subjects also.—C. G. G.

. The .

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REPRISALS.

BY "BERKELEY."

In early childhood the destruction by one infant of a treasured doll, the duly accredited property of another child, brought about a retaliatory act of war against such possessions as might be held by the initial aggressor. This is the expression in the language of military formalism of a "reprisal." A little later in life, when gentle disparagement of his momentary enemy's personal appearance or hereditary attributes gives amusement to the growing boy, the answer, if not immediately bellicose, is a variant of the "Tu quoque" common in the daily schools of Imperial Rome. That, too, is a form of "reprisal."

War itself is or should be an act of "reprisal." The declaration of war following the Peace of Amiens was ostensibly a "reprisal" for diplomatic offences. The conquest of the Soudan, which was completed in 1898, began as a result of the hasty and inopportune manners of Mahdism. Justifiable war is in truth always an act of reprisal for wrongs endured, and each nation entering into the heat of conflict endeavours as best it may to lay the blame of original offence on the other belligerent. But it is not of this kind of "reprisal" that the people dream in these times.

FREE ENJOYMENT.

The operations of war are conducted in accordance with certain rules and conditions that have from time to time been laid on paper in the presence of exalted representatives of the Great Powers assembled in conference. More important still than paper principles are those which are sanctified by tradition and custom from the earliest days of the earth. These principles impose certain restrictions on the free enjoyment of hostilities. Though war aims at the destruction of the armies and navies of the nations, not all destruction is to be regarded as proper.

The main definition is that only the actual armed forces of a nation are a part of the war. The peaceful citizen who does no more than provide the necessary money to assist the soldier in the practice of his chosen pastime is free from the imposition of violence. He and his wife and all that the Commandments include in his lawful possessions must be treated as though he were in a perpetual sanctuary. Public buildings, perhaps because of their resemblance to one's revered and elderly relatives, houses of religion, hospitals, and public monuments are not to be destroyed unless they are of deliberate tactical value to the forces in whose hands they may momentarily be.

Those who have sustained injury in battle or are sick are protected by the Geneva Convention from molestation by troops. Consequently hospital trains and ships conveying wounded to their country of origin should be secure from attack.

A MATTER OF EXPEDIENCY.

These customs are not merely dictates of humanity, not always in accordance with the stern necessity of war, but are formed as a matter of expediency, that the main object of the armed contest between nations may not be forgotten in a mire of needless butchery.

It does not help a rightful cause to ruin a well by emptying into it the mangled bodies of women and children as was done at Cawnpore during the great Mutiny. The Near East was not brought under French domination, despite the unspeakable brutalities of the Emperor Napoleon in the closing days of the eighteenth century. The Black Hole of Calcutta has made more impression on text-books of history than on history itself. And so throughout the tale of the world the unnecessary recoils on him who employs its methods.

During the present war the enemy Powers are reputed to have ignored the commonly accepted practice of war, and have on occasion adopted methods of imposing their will for which moral support is entirely lacking. In the majority of stated cases little can be decided until peace brings with it the possibility of proof. But of the sinking of hospital ships there is no doubt.

The enemy, in accordance with his fixed principles, announced his intention to the incredulous Allies, who not unnaturally regarded it as an empty threat. In due course the enemy redeemed his promise, and sank such ships as opportunity permitted to him. That no question of mistake might arise, he in his daily communiqué admitted that he had so acted. His excuse was that he had definite evidence of British hospital ships having carried drafts of troops from England to the Continent.

UNSOLDIERLY ACTION.

The action of the Central Powers is curious as well as unsoldierly. If there existed reason for suspicion as to methods adopted by the British Government in the employment of hospital ships, there are always neutral Powers available for the purpose of inquiries, and such neutrals can be readily acquitted of harbouring undue love for England. But for unstated reasons the Imperial German Government did not choose to take these steps, and instead violated all those customs that have tended to rob war of needless horror and have given perpetual life to chivalry.

The act committed, there remained only the consideration of the answer. National anger is a curious thing. Such acts should invigorate a nation in the prosecution of the war that by ultimate victory the punishment might be decisive and certain in its infliction. One engages in war with a view to victory, unless one's forces are so weak that a defensive is all that remains possible. The very principle of war is that it constitutes the most direct road to the attainment of the national will. Therefore logically there should be no other offensive act during its operation save those in pursuance of the strategy of victory.

LOGICAL REPRISAL.

But such views do not satisfy the public, nor their chosen representatives in Parliament. There must needs be "reprisals." Here again logic should have had a hearing. If the enemy sinks a hospital ship, then the legitimate answer, if one admits the legality of reprisals, is to sink an enemy hospital ship without delay. But the conditions of the present war make it impossible to sink a hospital ship of German nationality, for they do not exist. The next proper step would be to eliminate a proportionate number of German wounded already in our hands. But that would be a cold-blooded act for which there would be few available executioners.

The presence of German personnel in our hospital ships is no deterrent of the unwarlike atrocity of the enemy, even though a percentage of those carried might be of mediatised houses or even of the blood royal. The death of a German does not influence the Government of his Fatherland.

It was assumed by those in power in this country that the only appropriate answer was one which would in some manner impress on the German people the impropriety of the action of their leaders. The only method of so doing was to employ one or other of the Air Services and bomb an "open" German town. German civilians would then be killed, and their treasured buildings destroyed. Carefully drafted leaflets dropped



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in profusion during the bombardment would indicate to the populace the reason for the attack and induce feelings of distrust for their leaders.

The act done, several points arise. Firstly, whether it is not misplaced effort to bomb "open" towns when there are "fortified" towns of high importance so far free from bombardment. A raid over Essen and its purlieus would not only ensure the death of the requisite number of women and children, but would at the same time have a highly adverse effect on the production of munitions. Thus, while the principle of "reprisals" would receive support, the war would progress more swiftly towards the desired end.

There are many other towns which could be visited in similar manner and with similar duality of intention. Cologne and the great towns on the Rhine, if visited by a large bombing fleet, could be damaged in such manner as seriously to affect the lines of communication of the German troops in France. The Rhine bridges gone would cause weeks of delay. The moral effect, if any, would be the same in either case, and the strategical result would be greater in the case of the fortified towns than in that of the "open" areas.

It is doubtful whether such raids over residential areas have precisely the expected effect. It is possible, and those who have a knowledge of German psychology will

no doubt endorse the view, that though a German citizen might consider the total destruction of his wife and children as an unspeakable outrage against civilisation, he would at the same time regard the drowning of British wounded and bombing of English cities as a very proper punishment for a nation outside the pale of humanity. This being so, he would probably be strengthened in his loyalty to the Fatherland and in his determination to fight to the bitter end. The sinking of the "Lusitania" filled the English recruiting offices, and who can say that the bombing of Freiburg will not invigorate the German peoples in their hopeless struggle against the confederation they have offended so deeply?

To summarise briefly, it is not clear that "reprisals" are a wise act of war. If they be, then the means employed should be so directed as to secure as much military damage as possible in addition to the destruction of civil property. There are too few aeroplanes for routine work, and it may be wasteful to employ them otherwise.

The underlying principle in war is that effort should be made towards ultimate and complete victory. Each offence against the laws of war should invigorate every man, woman, and child in the country to renewed efforts in productions of munitions, and inspire the Army and the Navy with greater determination to end the war and punish the offender.

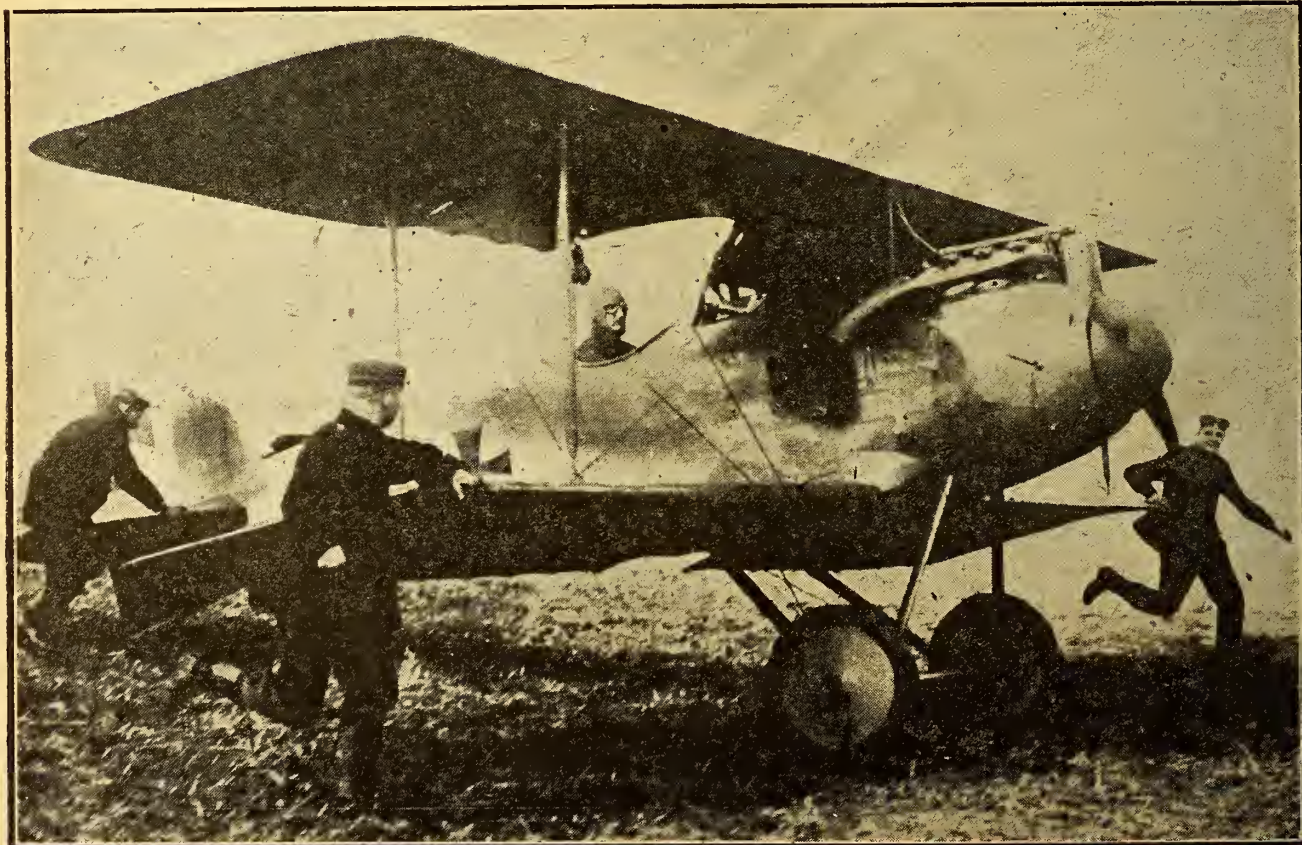
THE DEATH OF PRINZ KARL FRIEDERICH.

The "British Weekly" quotes an account by the Rev. Mr. M. Caldwell, official chaplain to German prisoners of war, and minister of the Lewin Road Baptist Chapel, Streatham, of his association with the last days of the late Prinz Karl Friederich, of Prussia, from which one gathers that the young officer died as befits an officer and a gentleman. Mr. Caldwell, among other matters, says:—"I visited the Prince each day from his arrival on to his death. He said, 'I was doing important work for my commander when I was attacked by British airmen. I kept on my course at first, but soon found that I had to defend myself against their determined onslaught. The contest was keen and exciting. I was hit on my foot, and the pain was intense, but that was not my undoing. My machine was hit

in a vital part, and, although I did my utmost to get back to my lines, I was compelled to descend in full view of the Australians. I saw the predicament I should be in when I landed, so decided to burn my machine and run for it. The Australians were too clever for me, and gave me a warm time when I took to my heels. I had a sporting chance and took it, but I was not a winner. I felt a twitching sensation in my back, and fell forward, done for.

"The Australians, whose prisoner I became, treated me with the greatest kindness. They are sportsmen and great men. I have a wonderful admiration for them."

"The dying man added:—"The kindness which has surrounded me since I became a prisoner has brought back the memory of those days. The Australians were good to me; the officers and



From a Photograph received from a Neutral Country.
The late Prinz Karl Friederich starting for his last flight.

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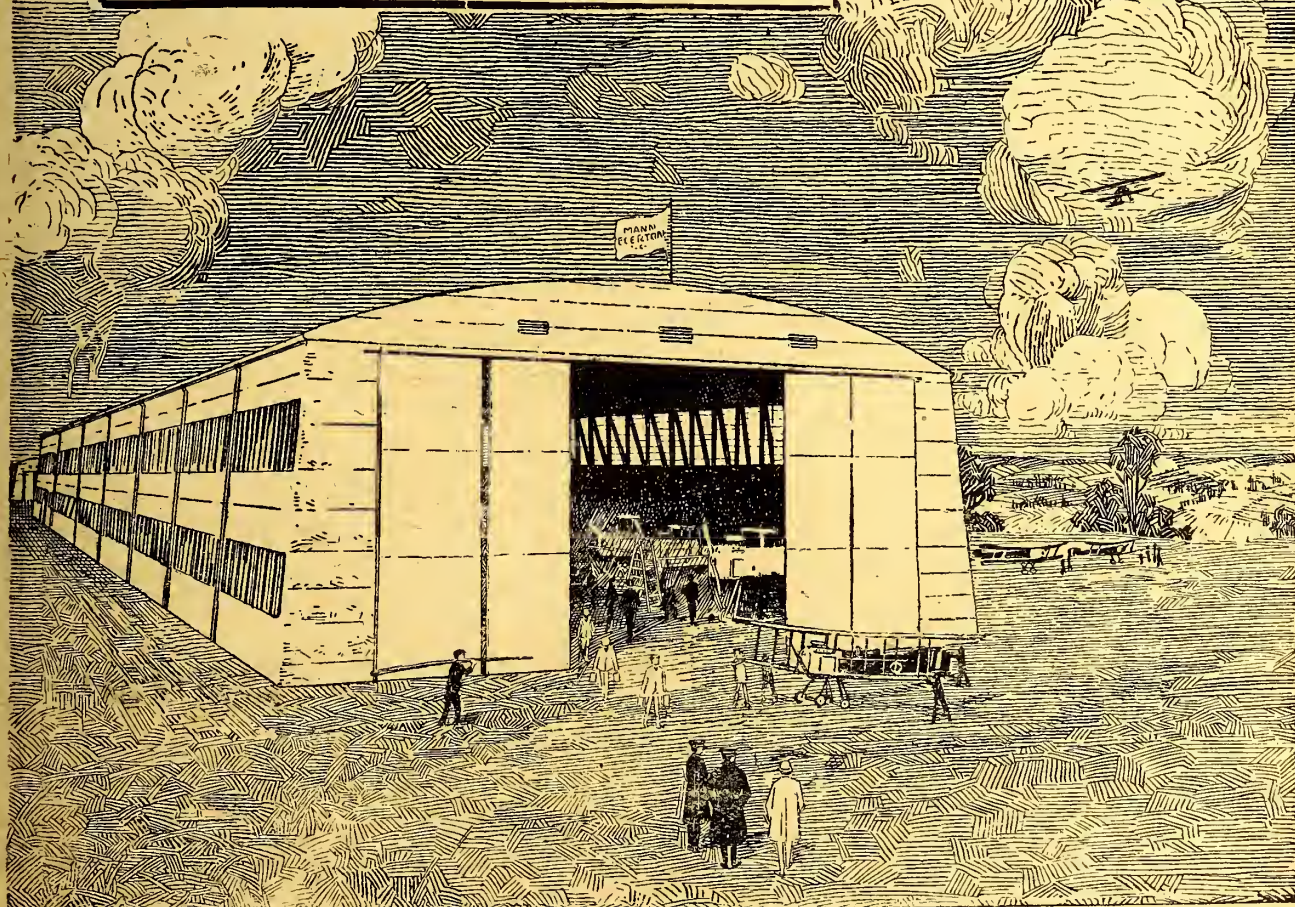
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soldiers who attended me coming down the lane were very considerate, and the whole atmosphere of this hospital is kindness.

"I lie here a helpless prisoner, but I have no regrets. I did my best for my country, and I am not sorry I am finished with the war. I want to live. I am young, and when the war is over I shall go back and help to build up my nation again."

"I took him chocolates and magazines which my friends in England had sent me, and he was profuse in his thanks when accepting them. He said:—'You are sure that I am not robbing others more deserving than what I am.'"

"He shook hands with me each time I came and went. An hour or so before he died I prayed with him. He was very weak and ill. When I finished he opened his eyes and with a smile said, 'Thank you, thank you very much.' He soon fell into unconsciousness, from which he never recovered."

THE TRAVELLING CIRCUS IN ACTION.

The High Command of the German Flying Service instituted some months ago the system of mobile chaser squadrons, consisting entirely of picked fighting pilots. These squadrons move *en masse*, as a complete unit, from place to place, and keep the air as clear as may be of hostile machines wherever they are thickest. The system has much to recommend it as against the system of splitting a fighting squadron up among several reconnaissance or bombing squadrons so that two or three of its machines are told off at a time to protect the slower types. These German fighting squadrons are known to the R.F.C. as "travelling circuses," owing to their acrobatic abilities, and are regarded with respect, if not with awe. The first of them to become famous was that of the late Capt. Bölcke, and the two best known at present are those of Capt. Baron von Richthofen and Capt. von Bülow.

Occasionally one of them meets with a surprise just when everything seems easy, and one of these surprises was rather

well described by the Special Correspondent of the "Times." Writing from War Correspondents' Headquarters on May 8th, he said that six of our aeroplanes started out, but one had engine trouble, so only five were there when the enemy appeared.

It was on May 5th, and there was a thick haze, so that the ground was almost invisible from 2,000 ft. Our men had started fairly late in the afternoon, and at 5 o'clock were well over in enemy country, when, with the sun at their backs, they saw two enemy machines ahead. They tried to close with the enemy, who made some show of giving fight. The tactics suggested that the two enemy machines were only a decoy. Even as our men started to chase the two flying enemies, out of the haze on all sides new fleets came closing in.

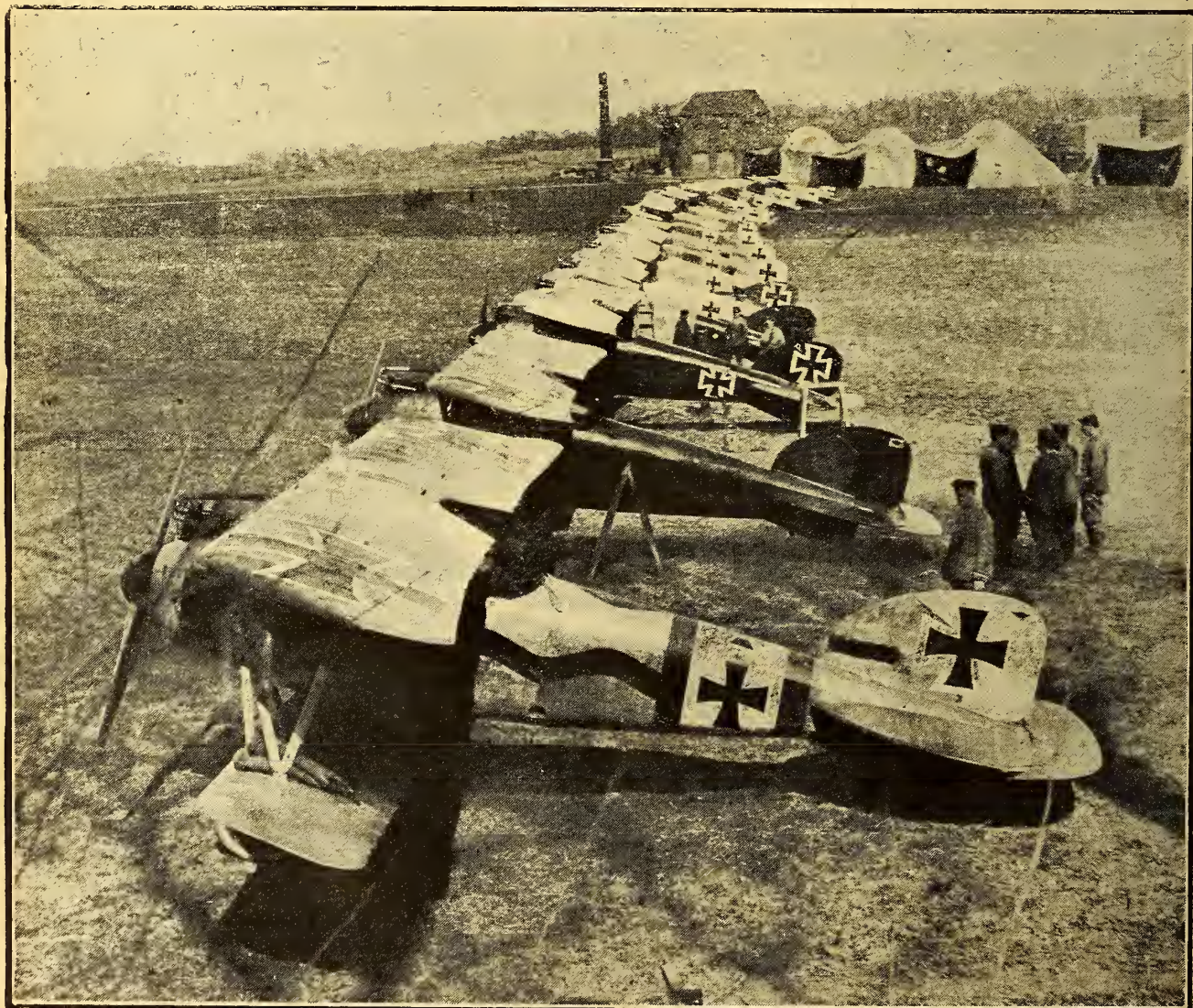
The new arrivals flew in three formations, two of which contained eight machines, and the third contained nine, making 25 German aeroplanes, all of a uniform fighting type, to whom the other two, which now ceased to run away, joined themselves, making a minimum of 27 enemy machines in all.

Cutting out much adjectival matter, which is pure journalese and does not materially assist the narrative, the "Times" account runs thus:—

One of the enemy fleets, taking advantage of the thick air, had passed behind our little squadron and came at it, straight between it and the sun. The other two fleets came from the south-east and north-east. As they approached they spread out so that our men were ringed round with enemies on every side.

The fight began at about 11,000 ft.; but in the course of the things that followed it ranged anywhere from 3,000 to 12,000 ft. And an extraordinary fact is that, all the while that it went on, the German anti-aircraft guns below kept at work. Usually, as soon as aeroplanes engage overhead, the "Archies" are silent for fear of hitting the wrong man.

Primarily, any such general mêlée inevitably breaks up into a series of individual fights. [Why "inevitably," seeing that in the



From a Photograph received from a Neutral Country.

Captain Baron von Richthofen's Travelling Circus ready to start. It may be noted that the Squadron Leader's machine bears a special identification band round the fuselage. It should also be noted that the Nieuport single-spar lower plane has been adopted by the Albatros Co.

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next few lines it is shown that they did not break up?—Ed.] "Formation," as it is technically known, breaks up, but nothing could have surpassed the way in which our men fought. Not one of them allowed himself ever to be cut off and isolated from the rest. This is the more remarkable as, with the exception of the Flight Leader, all the pilots were practically new men, with little experience of fighting. Some had only been in France a fortnight. As for the Flight Commander himself, he, still a youth, may fairly be called a veteran, for in that battle he reached his 17th German victim.

The actual fighting lasted from 5 to 6 o'clock, an extraordinary time for such a thing. The fight had lasted but a few minutes when an enemy machine, which Capt. A. had attacked, went down in flames, with the wings of one side shot away. Then Lt. B. caught his adversary at close range, and the German aeroplane went down turning over and over as it fell. Lt. C. scored next, his enemy's machine spinning plumb down to where, somewhere below the haze, it must have crashed. [This seems to be of the nature of an assumption rather than a logical deduction.—Ed.]

Lt. B.'s engine gave out and he was "compelled to leave the formation," and, as he fell, an enemy went after him. Lt. C. saw the German diving after, and before the German could do his work, the British aeroplane was almost touching the tail of his machine, and the German turned clean over in the air and crashed.

Then B.'s engine caught its breath again, and B., who was one of those who were new to the game, climbed and rejoined formation. Some 8,000 ft. he had to climb, with the baffled "Archies" blazing at him from below. Just as he "rejoined" another German fell. It was A.'s second victim.

Then once again it seemed that a throw had gone against us, for, still under control, but with flames bursting from its reserve petrol tank, one of our machines began to drop. Again an enemy dived for the flaming ruin as it fell, but, quicker than he, A. also dived, and while our crippled machine, still belching flames, slid off, with its nose set for home, the German, mortally hit, dropped like a stone.

It was just retribution. The unwritten laws of this marvellous game prescribe that no honourable fighter attacks an enemy in flames. Such an enemy is out of the fight, and has trouble enough for a brave man. The German who dived for our burning machine knew that he was doing an unchivalrous thing, and it may be that that knowledge unnerved him so that he paid the penalty. [The business is to kill the enemy, so there seems to be a flaw in the logic again.—Ed.]

Strangely enough, our burning aeroplane got home. I have seen the wreckage, with the reserve petrol tank on the roof bearing two bullet holes on one side and great ragged tears on the other where the bullets passed out. The flames had burned away the whole central span—[He means the "centre section."—Ed.]—of the upper plane. The thick rear main spar was charred and burned through—[If burned through it would have crushed under compression and the machine would have crashed.—Ed.]—and two ribs were completely severed and hung with loose blackened ends. Yet, like a great blazing meteor, it crossed our lines and came to earth, not indeed at its own home, but on safe and friendly ground; and as another aviator said to me in admiration, "He made a perfectly topping landing."

Lt. D. emptied a belt from his machine-gun into an enemy when so close that his wings almost brushed the other's rudder; and the enemy turned turtle, clear over on his back, and, spurring out a thick column of black smoke, went down.

Some of the enemy were already drawing off, but our men were in no mood to let them go, and before the enemy could disentangle itself from the battle two more of their machines had gone to earth—one, his third in the fight, falling to Lt. C. and one to Lt. E.

Then the last four of our machines came home.

It is deduced by the R.F.C. unit, of whom the "Times" man was a guest, that the German formation belonged to von Bülow's Circus.

OUR VARIEGATED FOES.

Mr. Percival Phillips, of the "Daily Express," writing on May 10th of the German fighting aeroplanes, says that the R.F.C. pilots now find that the Hun pilots are indulging in highly decorative if not precisely protective colouring:—

"It is like going out to fight birds of Paradise," said one scout, who complained facetiously that the dazzling tints of the Albatros and Aviatik machines nearly blinded him. Never has there been such an orgy of kaleidoscopic effects on the earth or above it. The Hun has taken to daubing his machines fantastically, after the manner of a savage who hopes to frighten his foe to death. A child let loose with a box of paints could not achieve more lurid results.

One British aviator who went out the other morning to search for trouble found it with a red body and wings that were green on top and blue underneath. One German squadron encountered recently was composed of machines painted white, red, and green and one of khaki colour, with greenish grey wings. Individual fliers have included a green aeroplane with a yellow nose, another with a red body, green wings, and yellow stripes, another with green body and yellow wings, another with scarlet body, brown

tail, and reddish brown wings, with white crosses on a bright green background, another with yellow body and red wings, with light blue tips, a black machine with white markings, a machine with one green and one white wing, and others with silver discs, yellow noses, and blue tails.

These harlequins of the air are apparently decked according to the taste of the pilots. Their gaudy dress has offended the artistic sensibilities of more than one British flying man who has succeeded in obliterating these specimens of decorative skill.

"When I see a Boche with a yellow and red nose, blue wings, and a green tail," said one youthful pilot, "I want to kill it. It is not so much a question of war as of common decency. They spoil the sky."

[It seems just possible that the Boche pilots are experimenting with coloured aeroplanes to see whether varying colours have any effect upon the range-judging powers of enemy pilots, or whether the use of brilliantly variegated stripes cramps their vision in some peculiar way. Startling primary colours in close proximity are distinctly trying to the eyes.—Ed.]

A RETURN FROM GERMANY.

Everyone in the Royal Naval Air Service, who has not already heard the news, will learn with much satisfaction that Squadron Commander E. Featherstone Briggs, D.S.O., R.N., returned some time ago from Germany. As the Censor has at last passed the information for the lay Press, it may be as well to put it on record here also.

Squadron Commander Briggs was shot down during the raid on Friedrichshafen in November of 1914, and was thereafter interned in the fortress of Ingoldstadt. During his residence there he was awarded the D.S.O., and the French Legion of Honour.

He was recently moved from Ingoldstadt to Krefeld, not far from Essen, and in the process of moving it appears that he and other officers left the railway carriage as the train pulled out of a station near Krefeld. After sundry adventures, about which it would be inadvisable to say much till after the war, Commander Briggs reported for duty at the Admiralty.

Squadron Commander Briggs will be remembered as one of the first Naval Officers to join the Naval Wing of the R.F.C. He was an Engineer-Lieutenant, R.N., at the time, and before the war was Engineer-in-Charge at the R.N. Air Station at Eastchurch, under Squadron Commander Samson, as he then was. In that capacity he did very much valuable practical work for the improvement of the Navy's aeroplanes, and early in 1914 he put the British height record up to some 15,000 ft. on a Blériot monoplane with an 80-h.p. Le Rhône engine. He was, in fact, the first officer in the Flying Services to recognise the merits of that excellent but much neglected engine.

At the outbreak of war he went to Flanders with Squadron Commander Samson's detachment of the R.N.A.S., and took part in the various operations carried out by that Service. In November, 1914, he was detached, together with Flight-Lieutenants Marix and Sippe, to take part in the famous raid on Friedrichshafen, which was organised by Lt. N. Pemberton-Billing, R.N.V.R. To Commander Briggs was entrusted all the mechanical details of the raid, and he spent some time at the Avro factory in Manchester preparing the three machines which took part in the raid. Some idea of the thoroughness with which this work was done is shown by the fact that these three machines were taken to pieces in Manchester, packed, delivered at Belfort, re-assembled there in an airship shed and flown straight off to Friedrichshafen without making a single test flight.

His return to duty will be heartily welcomed by all who have served with him. His promotion to Wing-Commander has been gazetted recently and has afforded much satisfaction to his friends.

THE DEMONSTRATION OF COMMERCIAL AERONAUTICS.

The lecture by Mr. G. Holt Thomas on May 30th on "Commercial Aeronautics" promises to be quite the most important event of the Aeronautical Society's season. As suggested a week or two ago the applications for tickets have already become so numerous that the meeting will be held in the large Central Hall, Westminster, better known to the older generation as the Royal Aquarium, opposite Westminster Abbey.

Mr. Holt Thomas is one of our best-known and most successful aeroplane manufacturers, and is Chairman of the Aircraft Manufacturing Company, Ltd. The films, which he will show to prove his arguments, have been specially prepared at very great trouble and expense, and will illustrate the "air-pocket-boat" at work.

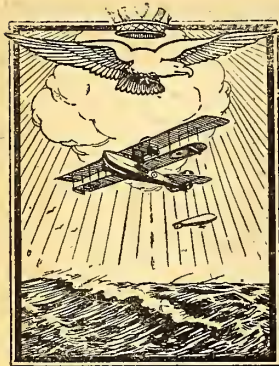
Lord Cowdray (President of the Air Board) will preside. Lord Northcliffe (Chairman of the "After the War" Aeronautical Committee) will speak, as will Lord Sydenham, for long one of our most distinguished scientific workers in the cause of the air, in both its military and commercial phases. Many of the leading Chambers of Commerce and Mercantile Associations will be represented.

Tickets may be had free from the Secretary, Aeronautical Society of Great Britain, 7, Albemarle Street, London, W.1., and those who wish to secure reserved seats are advised to apply early.

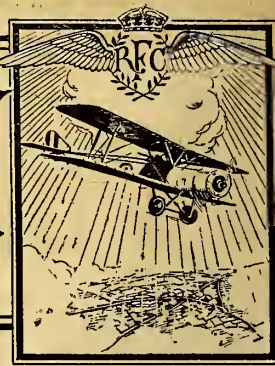
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smith, Jan. 1st. H. S. Kerby, C. F. B. Penley, H. E. C.
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Browne, M. J. Golding, R. H. Nicholson, R. E. Dean, C. L. E.
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H. C. Irwin, H. V. Worrall, R. J. Slade, P. S. J. Owen, A.
Sparrow, S. E. Taylor, W. H. S. Aplin, S. P. Martin, E. P.
Hicks, I. Macdonald, H. V. German, H. A. J. Wilson, T. R.
Hackman, J. G. Hudson, R. G. Gardner, J. F. Horsey, B. S.
Wemp, T. G. M. Stephens, F. C. Henderson, A. F. Buck,
J. F. Jones, J. C. Mitchell, G. D. Smith, G. L. E. Stevens,
W. H. Wood, H. R. Watson, C. Murray, L. W. M. Lloyd,
R. H. Horniman, H. W. Campion, W. P. Nicholls, E. E. Deans,
G. H. Simpson, A. B. Shearer, H. W. Evans, J. C. Railton,
B. A. Trechmann, R. Davies, I. G. Kelly, G. C. C. Kilburn,
M. Lyon, T. R. Spence, J. W. Walton, C. J. Moir, G. Moore,
P. S. Fisher, G. F. Meager, A. E. Popham, S. T. Edwards,
K. G. Macdonald, P. E. Beasley, D. A. H. Nelles, K. F.
Saunders, H. E. P. Wigglesworth, D.S.C., W. Huggan,
W. R. M. Hill, H. L. Hitch, H. R. Aird, H. A. Pailthorpe,
H. T. Jones, G. S. Abbott, G. G. McHardy, H. Rampling,
P. A. F. Belton, C. E. Moore, J. Gorman, C. J. Wyatt, T. H.
Newton, J. R. S. Devlin, W. R. Kenny, A. Durston, R. A.
Little, D.S.C., J. R. Ross, T. G. Culling, J. L. A. Sinclair,
S. Nixon, G. M. T. Rowse, D. R. Baylis, E. G. Hopcraft,
F. D. Casey, April 1st, 1917. Flt. Sub-Lts. to be Flt. Lts.:—
C. Perrett, A. F. E. Warner, A. V. Bowater, A. M. Waistell,
April 1st.

* * *

WAR OFFICE, May 8th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Flt. Comdr.—Sec. Lt. (temp. Lt.) S. E. Pither, K.O. Sco.
Bord., from a Flying Officer, and to be temp. Capt. whilst so
empld., April 25th.

SCHOOLS OF INSTRUCTION.—SCHOOL OF TECHNICAL TRAINING
(MEN.)—Comdt. (Graded as a Depot Comdr.).—Qrmr. and Hon.
Lt. (temp. Maj.) J. H. Wilford, R.F.C., from a special appt.
(graded as a Park Comdr.), and to be temp. Lt.-Col. whilst so
empld., April 11th.

Chief Instrs. (Graded as Park Comdrs.).—Lt. (temp. Maj.)
L. W. F. Turner, Spec. Res., from a Chief Instr., R.F.C.,
School of Mil. Aeronautics (graded as a Sqdn. Comdr.) and to
retain his temp rank whilst so empld.; temp. Maj. I. U. D.
Truman, Gen. List, from Comdt., Scottish School of Fitters
(graded as a Park Comdr.); Capt. V. O. Rees, Lond. R., T.F.,
from an Instr., R.F.C., School of Mil. Aeronautics (graded as
an Equipment Officer, 1st Cl.), and to be temp. Maj. whilst so
empld., April 11th.

Adjut.—Sec. Lt. (temp. Capt.) F. E. Vaughan, Midd'x R.,
T.F., and to be secd., April 11th.

* * *

WAR OFFICE, May 9th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
Wing Comdr.—Bt.-Maj. (temp. Maj.) C. E. C. Rabagliati,
M.C., Yorks L.I., from a Sqdn. Comdr., to and to be temp.
Lt.-Col. whilst so empld., April 11th.

Flt. Comdr.—Temp. Sec. Lt. H. J. Larkin, Gen. List, from a
Flying Officer, and to be temp. Capt. whilst so empld., April
12nd.

Special Appts.—(Graded as a Park Comdr.).—Qrmr. and Hon.
Lt. (temp. Capt.) J. E. Parkin, R.F.C., an Equipment Officer,
1st Cl., and to be temp. Maj. whilst so empld., vice Qrmr.
and Hon. Lt. (temp. Lt.-Col.) J. H. Wilford, R.F.C., April
11th.

Graded as an Equipment Officer, 2nd Cl.—Temp. Sec. Lt.
L. Legge, Gen. List, an Equipment Officer, 3rd Cl., and to be
temp. Lt. whilst so empld., vice Sec. Lt. (temp. Lt.) H. G.
Gold, Spec. Res., Feb. 28th.

Equipment Officers, 1st Cl.—From 2nd Cl., and to be temp.
Capt. whilst so empld.:—Sec. Lt. (temp. Lt.) G. Jacques,
Spec. Res.; Sec. Lt. (temp. Lt.) S. G. Frost, Spec. Res., March
31st.

* * *

WAR OFFICE, May 10th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Adjut.—Temp. Lt. H. H. Walmsley, Border R., and to be
trans. to Gen. List, vice Lt. G. C. Gold, R.F.C., Spec. Res.,
April 1st.

R.F.C.—MIL. WING.—Flt. Comdr.—Sec. Lt. S. P. Simpson,
Bedf. R., from a Flying Officer, and to be temp. Capt. whilst
so empld., April 23rd.

* * *

WAR OFFICE, May 11th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
Flt. Comdr.—Lt. R. L. Keller, R. War. R., Spec. Res., from
a Flying Officer, and to be temp. Capt. while so empld., Apl. 28th.
Balloon Co. Comdrs.—(Graded as a Sqdn. Comdr.).—Temp.
Lt. (temp. Capt.) G. A. N. Mitchell, R. Fus., from a Balloon Co.
Comdr. (graded as a Flt. Comdr.), and to be temp. Maj. while
so empld., April 19th.

Graded as a Flt. Comdr.—Sec. Lt. (temp. Lt.) F. C. Mears,
Spec. Res., from a balloon Comdr. (graded as a Balloon Officer),
and to be temp. Capt. while so empld., April 19th.

* * *

The King has been pleased to confer the Military Cross on the
following Officers in recognition of their gallantry and devotion
to duty in the Field:—

Temp. Sec. Lt. William Baillie, Gen. List and R.F.C.

Although very severely wounded during a combat with hostile
aircraft, he succeeded in bringing his own machine back and
effecting a safe landing.

Sec. Lt. Edmund Barry Cahusac, S. Staff. R., Spec. Res., attd.
R.F.C.

He carried out a successful artillery observation on a hostile
battery in very adverse weather. He worked for two and a half
hours at a height of 1,500 to 3,000 ft. under very heavy fire.
On another occasion, whilst engaged on photography, he drove
off three hostile scouts and completed his work.

Capt. Douglas Reginald Gawler, R. Scots and R.F.C.

For consistent good work whilst carrying out artillery obser-
vation and for gallantry on many occasions. On one occasion he
continued his observation work in spite of being attacked by
several hostile machines and in spite of being under very heavy
fire.

Sec. Lt. Robert Hamilton, High. Cyclist Bn., attd. R.F.C.

As an observer he carried out a successful artillery observa-
tion on a hostile battery in very adverse weather. He worked
for two and a half hours at a height of 1,500 to 3,000 ft. under
very heavy fire. On another occasion, whilst engaged in pho-
tography, he drove off three hostile scouts and completed his
work.

Temp. Sec. Lt. William Drummond Matheson, Gen. List and
R.F.C.

In leading a formation of eight machines against 16 of the
enemy he drove down one hostile machine and eventually suc-
ceeded in landing his machine safely in spite of being attacked
by several enemy machines. On other occasions he has brought
down four hostile machines.

Temp. Capt. Lancelot Lytton Richardson, Gen. List and R.F.C.

He attacked a formation of five hostile scouts, and brought
two of them down. On another occasion, although himself
wounded, he destroyed two hostile machines and drove down,
damaged, at least two others.

Lt. (temp. Capt.) Donald Campbell Rutter, R. Suss. R., Spec.
Res., and R.F.C.

(Continued on page 1274.)

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AERONAUTICAL ENGINEERING

SUPPLEMENT TO "THE AEROPLANE"

INCORPORATING AIRCRAFT ENGINEERING, AERODYNAMICS, AND MATTERS PERTAINING TO THE AERONAUTICAL ENGINEER AND THE AIRCRAFT TRADER

The British Aircraft Industry.

BY CHARLES L. FREESTON.

(Founder Member of the Royal Aero Club.)

XVI.—FREDK. SAGE AND CO., LTD.

Before the war broke out it would have been difficult to name any product that was more highly specialised than the aeroplane. Behind its designing there was genius, while its manufacture was confined to a limited number of trained hands; in a word, it seemed the last thing on earth that could be suddenly produced in quantities from blue-prints and fashioned by men and even women who did not know a wing-tip from a fuselage.

None the less the war has shown us that it is the design alone which is paramount, and that craftsmanship, under suitable direction, can be successfully applied to the wholesale manufacture of what is even *sui generis*. From the national point of view this is all to the good, for it has enabled a vastly greater number of machines to be built under contract than would otherwise have been possible. And though some of the firms which have built aeroplanes to order as contractors or sub-contractors during the period of the present crisis will revert to their normal undertakings after the war, it can hardly be doubted that others will remain part and parcel of the industry, and thus ensure the maintenance of a large defensive force of aircraft; and this consummation is the more probable now that a special committee has been appointed to consider the conservation of the existing means of aeroplane production, and the uses to which it may be applied in times of peace.

A SATISFACTORY COMBINATION.

The best results, of course, have been achieved in those cases where a firm which was outside the aircraft industry before the war, but was called upon to assist the nation in its hour of need, was not content simply to work in routine fashion from Government designs, but established an aviation department under the control of some well-known personality in the world of flight.

A typical example is that of Fredk. Sage and Co., Ltd., of London and Peterborough, whose name was a household word before the war in connection with the manufacture and supply of shop fittings. The company took up the task of aeroplane production in the summer of 1915, and shortly afterwards acquired the services, as general manager of the aircraft work, of Mr. Eric Cecil Gordon England.



Mr. Eric C. Gordon England.

THE TALE OF A KITE.

Albeit now only twenty-six years of age, Mr. Gordon England is one of our most experienced pilots, having made his first attempts at flight so far back as 1909. His *penchant* for the air first declared itself when he was a boy of eleven, at which mature age he built himself a man-lifting kite.

It proved only too effective, for when he put it to the test it lifted him off the ground so quickly that prudence suggested his leaving go at once, and the kite sailed away into the *ewigkeit*.

EARLY EXPERIENCES.

Later on he became a premium apprentice in the Great Northern locomotive works at Doncaster, but all his leanings were towards aviation.

When the first Aero Show was held in London he visited it with the sole object of finding a job in the nascent industry. There he joined forces with Mr. Pemberton-Billing, and took charge of the flying ground which the latter had opened at Farnbridge.

Then the famous Mr. José Weiss appeared upon the scene with an inherently stable monoplane of his own design, and shortly afterwards Mr. Gordon England carried out some gliding experiments with this, on the inventor's behalf, at Amberley, in Essex, where he succeeded in making the first practical demonstration of soaring flight. The machine had no controls and no engine, but against a 20-miles-an-hour wind Mr. Gordon England made a glide of one minute and rose to 100 ft. higher than his starting point on Amberley Mount and his achievement still ranks as a world's record.

In the possibilities of the Weiss monoplane, it is interesting to note, Mr. Gordon England is still a firm believer, and declares that it will yet have its day. It was absolutely stable, and required no warping whatever. At Farnbridge it had been fitted with a 12-h.p. Anzani engine, the first of its kind in this country, and later on this was replaced by a 25-h.p. Anzani, which was also an innovation. With this some experiments were made on the sands at Littlehampton.

A MOVE TO BROOKLANDS.

Eventually, however, in June, 1910, the machine was transferred to Brooklands, where Mr. Gordon England flew it for

some time, though, owing to lack of engine power, he never got beyond the stage of fairly respectable straight flights. Then he bought the Harriot monoplane, the original and famous "Henrietta," on which he taught himself to fly to really practical effect. It had only a 35-h.p. E.N.V. engine, however, and he could not get sufficiently long flights out of the machine to enable him to qualify for a pilot's ticket, but would otherwise have been able to secure that honour in the autumn of 1910.

THE FIRST CRASH.

The Weiss monoplane had meanwhile been fitted with a 35-h.p. E.N.V., and he flew this machine also, but at a height of 60 ft. the structure gave way, and the machine fell into the sewage farm with a complete somersault. This was the more regrettable from the fact that she was flying beautifully at the time.

TWO YEARS WITH THE BRISTOL.

Owing to the good offices of the late Mr. Graham Gilmour, who had shown a great interest in our young aspirant's efforts, Mr. Gordon England was engaged in the spring of 1911 as an instructor by the British and Colonial Aviation Co., of Filton.

At that time he had not even formally obtained his pilot's ticket, but the Company accepted Mr. Gilmour's assurance as to his friend's capabilities, and were not deceived. He qualified forthwith, on a Bristol biplane, and was awarded his brevet on April 25th. The qualifying flight, it may be added, was completed in the dark, and he landed by a petrol flare. He stayed nearly two years at Filton, and designed several machines for the Company, as well as doing a certain amount of instruction work at Larkhill; in fact, he gave General Henderson some of his first flights.

A CHANGE TO THE SEAPLANE.

Then in 1913 Mr. Gordon England joined Mr. James Radley at Huntingdon, and together they produced the Radley-England seaplane, which they entered for the Circuit of Britain race. After testing it as a land machine at Huntingdon, they took it to Brighton. It was fitted with three 50-h.p. Gnome motors, coupled together and driving a slow-running propeller. This, the first triple-engined machine in the world, was extraordinarily successful on its trials, and its builders never altered the length of a wire or anything else from the time when it first came out of the shop to the day when its career was ended.

AN UNFORTUNATE END.

This contretemps occurred at Brighton during its trials as a seaplane. It was a two-seater machine, the pilot and passenger sitting about 10 ft. apart in the pontoons, and one day Mr. Gordon England took up a photographer who became more than a little frightened. When in the act of landing, the pilot looked up at his passenger while descending rather steeply, with the result that the machine ran over a buoy, knocked the bottom out of one of the boats, and was sank. A second machine was built forthwith, and this was fitted with a British engine, which unfortunately did not fulfil expectations, and the machine did not make a start in the race.

A REMARKABLE EXPERIENCE.

By this time Messrs. Radley and England had established themselves at Shoreham, but soon afterwards the partnership was dissolved and the plant taken to the Cedric Lee firm. Mr. Gordon England stayed with them some time, managing the works and helping to produce the "Secret Circle" plane. He improved the design a good deal and then flew the machine, taking it straight out of the shed and off the ground.

When coming back over the aerodrome, however, the machine suddenly "looped the loop" and fell on the sheds, with the result that the pilot spent two and a half months in bed and had a couple of operations on his knee.

A FLIGHT OVER KIEL HARBOUR.

After his recovery, Mr. Gordon England went to Messrs. S. J. White and Co., at East Cowes, and did their testing work, and also flew for the Norman Thompson firm as well. On

behalf of the former company he went over to Germany, and was flying a Wright seaplane at Kiel when the Kaiser reviewed the combined German and British fleets.

The most impressive sight, says Mr. Gordon England, which he ever witnessed was that of the fleets lying below him in Kiel Harbour when he was flying at 3,200 ft., and the ships suddenly all started firing together. Just behind him was an old Zeppelin, and he therefore claims to have been the first Englishman who ever flew near a "Zepp." Curiously enough, he was due at Kiel again only just before the war broke out, the best seaplanes that the England could produce at that time being on the point of delivery in Germany!

ROUND THE COAST.

Having been principally concerned with designing and testing Mr. Gordon England has not figured in aerodrome or other events, and never flew at Hendon or went in for duration work. His longest flight was one of 100 miles round the coast in 2½ hours. But it was with a distinctly varied experience at his back, none the less, that he went to Frederick Sage and Co., Ltd., in September, 1915.

WAR WORK.

The aviation department had been inaugurated two months earlier, and Mr. Gordon England took up the general management with vigour and upon lines which have been crowned with complete success. The entire business of the firm, in fact, is now devoted to aircraft production, both at Peterborough and the London works, and not only has the capacity of the original premises been doubled, but other factories have been acquired as well.

THREE RECORDS.

A start was made upon — seaplanes fitted with the 225-h.p. Sunbeam engine. Although the work on these machines was begun simultaneously with four other firms engaged on similar contracts, Fredk. Sage and Co., Ltd., were the first to have their machine out for testing. On its very first flight they broke the existing seaplane record, for pilot and passenger, with an altitude of 10,600 ft., as against the previous figures of 8,000 ft.

A very novel type of scout was then produced, entirely enclosed. It was fitted with a 100-h.p. monosoupape Gnome, and did 110 miles per hour. Full of promise as the machine was, it was particularly unfortunate that its career was cut short by an accident which completely wrecked it, and it was not rebuilt.

Subsequently, another record was secured on a slightly modified type of — biplane — namely, a height record under war conditions with full load. This record, it may be added, still stands to the credit of the Sage — machine.

A record of another kind was gained by the firm — that of the smallest number of "rejects" in the propeller factory, and this result was achieved on their first contract.

A HAPPY RESULT.

Numerous school machines, of their own design, with dual control, have been built by the Sage firm, in addition to the production of seaplanes of another type. Of recent developments it is not permissible to speak, but this much can be said — that the Sage sea machines themselves have established a unique reputation for general excellence. A recent testimony from Egypt, for example, is to the effect that they last longer and keep their flying trim better than any other.

This happy result may be ascribed to the excellent system under which the production is controlled. A most rigid system of inspection is maintained, and all the material is tested for strength, whether it has been passed by the I.A.D. or anybody else. The aim of the firm has been to produce a *machine de luxe*, where seaplanes are concerned, and the work goes through with a minimum of "rejects." The Sage machines have thus earned a fame upon which the firm and Mr. Gordon England are alike to be congratulated, and which will stand them in very good stead when the war is over, and the firm is embarked upon aeroplane production upon commercial lines.

THE SOCIETY OF BRITISH AIRCRAFT CONSTRUCTORS.

OFFICIAL NOTICE.

A meeting of the council of the Society was held in the library of the Aeronautical Society, Albemarle Street, on April 25th, 1917, when the report of the committee of management was considered, and various special points mentioned in that report were discussed.

It was decided that in future these reports should be sent to all members of the Society.



Messrs. Peter Macgregor (Sanderson Bros., and Newbould, Ltd.), Frederick Best (Thos. Firth and Sons, Ltd.), and W. H. Thomas (William Jessop and Sons, Ltd.), were added to the council as representatives of the Aircraft Steel Makers' Committee.

The subjects discussed at the council meeting included the position with regard to aircraft labour questions; the effect which increased wages awarded by the Government to aircraft makers have upon contract prices; and the position with regard to National Service and supplies of aircraft labour.

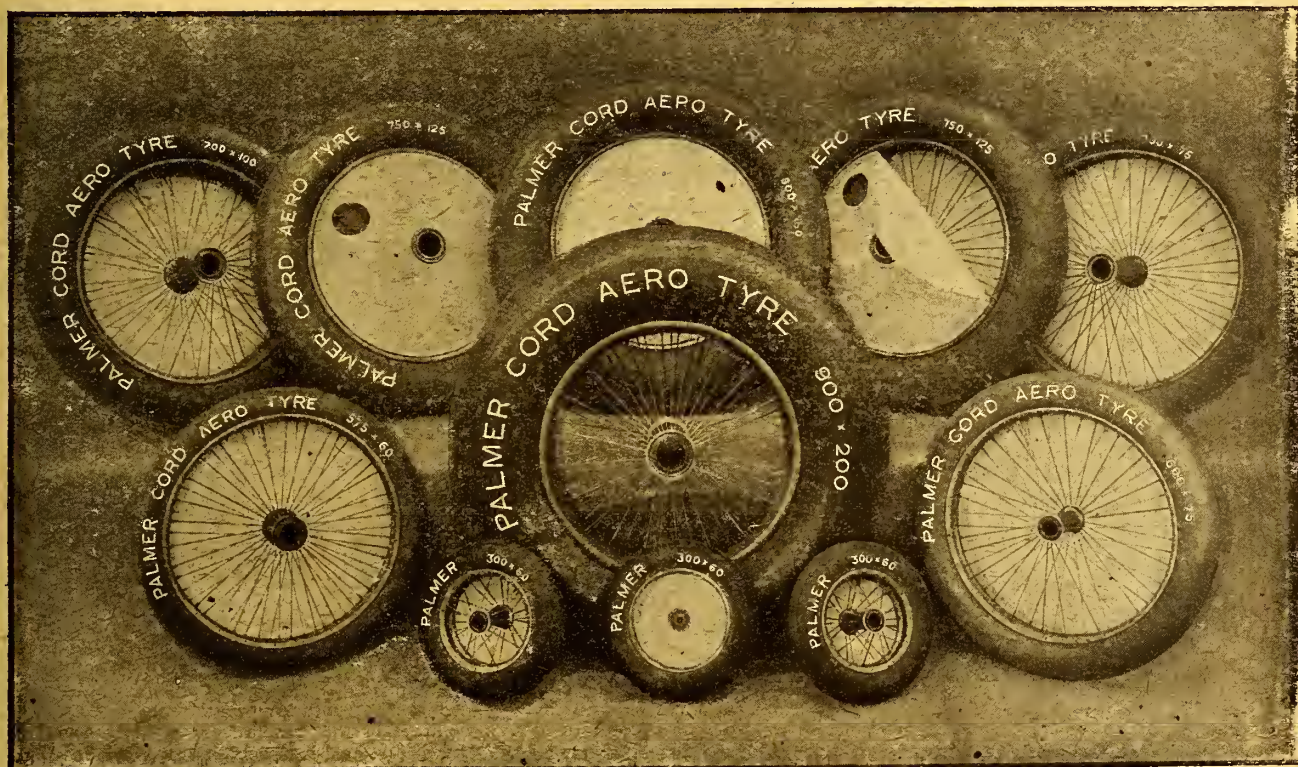
It was decided that the Society should become members of the Federation of British Industries.



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"	17	72.39	12.7	Central	"	*80	178.	44.45	132/46	"	33	150.	38.09	Central
450 x 60	30	89.	31.75	Central	"	*91	178.	31.75	132/46	"	66	178.	38.89	132/46
575 x 60	14	150.	38.09	104/46	"	*98	178.	44.45	Central	"	96	178.	55.	132/46
"	21	160.	28.	Central	700 x 100	2	185.	55.	135/50	800 x 150	8	185.	55.	135/50
"	34	150.	31.75	104/46	"	4	185.	55.	Central	"	10	185.	55.	Central
650 x 65	9	178.	44.45	132/46	"	18	178.	44.45	132/46	"	36	185.	55.	135/50
"	20	178.	38.09	132/46	"	26	150.	40.	Central	"	40	185.	60.32	135/50
"	75	178.	31.75	132/46	"	33	150.	38.09	Central	900 x 200	42	185.	60.32	125/60
600 x 75	14	150.	38.09	104/46	"	66	178.	38.89	132/46	"	47	185.	55.	125/60
"	21	160.	28.	Central	"	96	178.	55.	132/46	1000 x 150	97	250.	65.4.	Central
"	34	150.	31.75	104/46	750 x 125	2	185.	55.	135/50	1100 x 200	52	185.	55.	116/69
700 x 75	9	178.	44.45	132/46	"	4	185.	55.	Central	"	57	185.	55.	Central
"	20	178.	38.09	132/46	"	18	178.	44.45	132/46					

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AIRCRAFT AND MOTOR CAR ENGINE DESIGN: CONTRASTED FROM THE STANDPOINT OF A DESIGNER AND MANUFACTURER OF BOTH TYPES.

BY LOUIS COATALEN.

The following paper was read before the Aeronautical Society of Great Britain to-day, May 16th:—

In addressing myself to the members of the Aeronautical Society of Great Britain, the oldest institution of its kind in the world, I have to bear in mind that a section only of that membership is composed of designers of internal combustion engines. Therefore, I have striven to make my remarks this evening as intelligible as possible to those who have not had such training.

At the outset, too, I take the opportunity to thank the Admiralty for giving permission for a paper to be read on so instructive a subject with a view to its being discussed within the limits which it is necessary to impose on a topic of this sort in face of our being engaged in the greatest war in history.

The belief which appears to obtain in some quarters to the effect that the design and production of an aircraft engine is akin to that of a motor-car one proves, on even casual investigation, to be what the old writers would have styled a vulgar error. By taking a few points which come most obviously to mind, we discover at the very outset that the problems involved by the two propositions are fundamentally different.

CHIEF CHARACTERISTICS OF A CAR ENGINE.

Consider for a moment the chief characteristics of an internal combustion engine for motor-car service:—

- (1) Weight is practically no object.
- (2) Cost is of the utmost importance, therefore there must be the minimum of machining, as instance the fact that the connecting rods of a motor-car engine are not milled, nor are the crankshafts machined all over.
- (3) It must be capable of production in great quantities at minimum cost; otherwise, with the least amount of labour.
- (4) It must be silent to the extreme of what is practicable.
- (5) The maximum effort of which the engine is capable is not needed to be maintained for long at a spell. It seldom works at full power, and the brief duration of such effort explains the extraordinary reliability of even the inferior types of car engines.
- (6) Flexibility, giving a constant torque at a crankshaft speed from 300 revolutions a minute to 1,600 revolutions a minute.
- (7) Of course, this is a torque which corresponds to a very low mean effective pressure, namely, 80 lbs.
- (8) The compression is relatively low and the valve area small, the cam forms being easy and the valve springs light.
- (9) The system of lubrication wherein the oil is carried in the base-chamber of the crank case, suffices.
- (10) The maximum horse-power required to be developed by any one engine rarely approaches 100. In the vast majority of cases it does not exceed 30.

AND ONE FOR AIRCRAFT SERVICE.

By contrast, the factors governing the design of an aircraft engine may be enumerated thus:—

- (1) Weight is of prime importance.
- (2) Cost is not the deciding factor provided the necessary amount of power is obtained for the given overall dimensions of the engine, and for its weight as regards material and fuel, water and lubricant consumption; and that the desired degree of reliability is obtained.
- (3) The amount of labour necessary to produce a satisfactory aircraft engine of high output is, and will be, always many times what is necessary in the case of a car engine, and is a matter of secondary importance provided the desired results are obtained. No machining is too expensive if it saves weight.
- (4) Silence is relatively unimportant.
- (5) The aircraft engine does all its work at practically full power.
- (6) Flexibility, or constancy of torque, is of very secondary importance, because an aircraft engine is required to work at practically one speed only, or, at most, at an extremely narrow range of speed.
- (7) But its working range of speeds is such as to call for a very high brake mean effective pressure, say, 130 lbs.
- (8) The compression must be relatively high and the valve area large, while the valve springs must be stronger than for a motor-car, due to the cam form imposed.
- (9) The high mean effective pressure necessary, coupled with the fact of the engine doing nearly all its work at full power, involves a completely different point of departure in determining details of design, and, notably, the exploitation of new methods of achieving lubrication. Experience has demonstrated abundantly that when the base-chamber is used as an oil well, as in motor-car practice, the lubricant soon becomes too hot, therefore a fluid, resulting in reduction of pressure to the main bearings;

hence, the evolution of the dry sump system for lubricating aircraft engines. Oil viscosity varies greatly with the temperature.

EVOLUTION OF THE DRY SUMP LUBRICATING SYSTEM.

I would mention in parenthesis that the history of the engine dry base lubricating system is neither more or less than the story of my racing experience on the Brooklands track. In the course of long runs on it years ago it was found that the oil pressure went down more and more the longer each run was continued. Naturally, we tried one brand of oil after another with the view to discovering which would retain its viscosity most effectively. Of course, castor oil gave greatly superior results to mineral oils. Even so, however, it soon became plain that the problem was one that could not be solved entirely by the use of a vegetable oil. Indeed, results were quite unsatisfactory, notwithstanding that we greatly increased the effectiveness of the pump employed.

Therefore, my next step was to use the same pump to force the oil out of the base-chamber through two 1 in. copper pipes arranged round the car. We returned the oil direct from that process of cooling to the service of the bearings under pressure. This proved a great advance as regards maintaining pressure; but the scheme involved all the inconvenience of a long circuit for the oil in connection with which all the cooling was achieved under pressure, because the oil passed quite round the car before being returned to the bearings.

Therefore, the next stage was to employ two pumps. One forced the oil out of the base-chamber through a cooler, from which it passed into a tank placed at the back of the car. In this tank the oil was not under pressure of the pump, for the tank itself was merely under atmospheric pressure. In practice it was found that this was really a rotatable improvement. Thus the bulk of the oil was kept all the time in the tank, which itself was in a draught while the car was travelling, while the base-chamber itself was kept quite empty. From the tank the oil passed to the pump, and was so forced by it into the bearings. Therefore, the oil was under pressure only for a short distance, namely, from the pump to the bearings, because, as has been explained already, the tank itself was under atmospheric pressure.

Only when we had arrived at this stage was it found that racing cars with engines of high output could be run for more or less indefinite periods without the temperature of the lubricating oil attaining more than 66 degrees Centigrade, at which warmth a very good working viscosity was retained.

(10) Lastly, in contrasting the standard car engine, the racing car-engine, and the aircraft engine propositions under the headings that have been selected for the sake of illustration, it is to note that the total amount of horse-power required to be developed by practically all aircraft engines to-day is about 100 minimum, while the maximum totals several hundred horse-power per unit.

TWO DISTINCT PROPOSITIONS.

It will be seen from these ten points of contrast which, doubtless, might be increased in number, that the aircraft engine of to-day is not akin to the standard motor-car one. Admittedly, the twain are collaterals, both deriving from a common stock, the four-stroke cycle, petrol internal combustion engine. For the rest, the aircraft engine of to-day is, perhaps, as little like the standard motor-car one as that resembles the variety used on a commercial motor vehicle or that installed in a motor-boat. In fine, it may be said, as the stationary gas engine resembles the portable petrol variety to that meagre degree, and scarcely more, does the motor-car resemble the aircraft type.

It cannot be proved that the aircraft engine has been developed from the touring car variety. On the contrary, it can be demonstrated abundantly that the aircraft engine is quite a distinct branch of the development of the internal combustion engine. Hence many firms that have been strikingly successful in producing car engines for either touring or commercial use have experienced great and, in some cases, unsurmounted difficulty when called upon to change over to the manufacture of power plant for aircraft. The differences apparent in the design become even more pronounced when they are translated into manufacturing problems in the shops.

On the other hand, we may not lose sight of the likelihood that the very rapid evolution of the aircraft engine during this war, and the extraordinary manufacturing experience and developments of which that is the outcome, will at some future time exercise a more or less temporary effect on the design and manufacture of engines for car service.

Be this as may be, in broad terms I am of opinion that the two schools of design, one concerned with each of these problems, will continue to advance for the most part along two distinct

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lines which will rather become more than less divergent. Hence on the present occasion little further attention need be devoted to standard engine design for car practice.

Suffice it to observe that to date the non-technical opinion of the buying public, which opinion is not to be depreciated altogether, has exercised a not inconsiderable and, on occasion, detrimental influence on the designer and manufacturer. It will be observed, incidentally, that this element affects the proposition of aircraft engine design scarcely at all, especially under the conditions which are beginning to govern the industry towards the conclusion of the third year of war.

THE ANALOGY OF THE RACING CAR ENGINE.

By contrast, there is another type of engine specially built, as distinct from standardised, and which is fitted to a few motor chassis only each year in relation to the total number produced, because it is evolved and employed for racing purposes solely. Admittedly, in the beginnings of the motor industry the racing car of one year became the standard vehicle the succeeding season.

With the lapse of time, however, racing became so highly specialised that if the individual competitor was to enjoy any prospect of success during the last four or five years the racing engine had become a proposition utterly distinct from those standardised for service or ordinary civilian motor vehicle uses. This point is proved by a summary of the main characteristics required of a racing car engine, and which we find are to a considerable extent identical with those needed for an aviation engine.

Thus:—

- (1) Weight is of importance.
- (2) Cost is unimportant.
- (3) The amount of labour and the time necessary for production are matters of relative indifference provided the maximum output of horse-power is obtained for a given size of engine. That demand has led manufacturers to employ overhead valves, which are also used in aviation service and which so far have been employed comparatively little in standard car practice, partly on account of the principle not being so quiet in operation as the side-valve system. Every part of a racing car engine must be machined. The connecting rods are milled to the minimum section, and so forth.
- (4) Silence is of no importance whatever.
- (5) The racing car engine does all its work at practically full power, but the constancy of its torque has to be extended over very much wider ranges of speed than is needed so far in the case of an aircraft engine. From 1,600 to 3,400 crankshaft revolutions a minute is called for in the former case, whereas in the latter the normal speed is 2,100. The last-named figure chances to be no less than 1,100 revolutions a minute slower than the capacity of Sunbeam-Coatalen racing car engines. Therefore, it will be appreciated that the engine for racing car service is submitted to bigger stresses than the present-day aviation engine; but that this period of high stress in the case of the vehicle variety is much shorter than obtains in that of the aviation type unless, indeed, the car is being run on a track. Even in that event twelve consecutive hours is considered a very long spell, whereas in aircraft service that period of uninterrupted power output is held to be all in the day's work.
- (6) Under the heading of flexibility the engine for your racing car must be more akin to standard car requirements than to those of aircraft service. This characteristic, therefore, works out as a disadvantage to the racing car engine. When employed on dry roads with efficient gears and so forth the starting torque mounts up to a high figure, whereas in the aircraft engine at starting there is no load on the propeller. It increases, roughly, as the cube of the revolutions.
- (7) The racing car engine resembles the aviation type in that a very high mean effective pressure has to be obtained with both. In some racing car engines it has amounted to 135 lbs. to the square inch, taken from the brake horse-power developed at the flywheel.
- (8) As the problem is power for engine weight and volume, and not silence and low cost, great freedom is allowed the racing car engine designer as regards piston clearances, valve timing, compression, largeness of valve area, strength of valve springs, and so forth, the opportunities in this connection approximating much more to aviation than to standard car engine practice.
- (9) The high mean effective pressure necessary, coupled with the fact of nearly all the work being done at full power, calls for lubrication methods quite distinct from standard car practice, albeit as yet these have rarely approximated to that of aircraft engine practice, though the problems of maintaining pressure in the oil circuit and of keeping the temperature of the lubricant normal are common to racing and aviation service.
- (10) Comparatively large horse-power is needed in the case of all engines for racing cars, the average being anything from 80 to 225 horse-power, therefore, much more on a plane with the demands for aircraft service than with those for the touring car, the town carriage, or the utility motor vehicle.

Lastly, outside influence, traceable in the case of designing the private car engine and the commercial motor vehicle one, is

scarcely, if at all, to be detected in those of the racing car engine and of the aircraft variety. The racing car type has been developed with the utmost rapidity through various stages along the lines of maximum power combined with low, as distinct from minimum, weight, and with the utmost reliability, notably with a view to enabling the machine to be run for long spells without loss of power.

We might, perhaps, complete our survey of the inter-relationship of these three branches of motor engineering enterprise by adding that in the aircraft engine we have to economise weight considerably over the degree that will suffice for racing car practice, while economy of fuel and oil consumption are also more important in the case of the former than the latter. Admittedly, in the racing car engine those two features constitute a special and important factor, but not one that has had to be studied yet on entirely different lines from standard car practice.

Accordingly, perhaps we might conclude not unreasonably by stating in general terms that one stage in the development of the aircraft engine is represented by racing car enterprise as well as, perhaps, by certain sporting motor-boat work. Endeavours in these directions provided us with the data from which were designed the first engines evolved on lines to be of such efficiency as the present-day aircraft variety.

In face of our being now in the third year of war, and therefore for the most part somewhat out of practice in the matter of racing car engine design, whereas the leading firms in the industry in Europe have by now accumulated much experience of standardising aircraft engines, though of recent years none of them have ever standardised any for racing service, it may be said that the data on which aircraft engines are being designed to-day derives wholly from cumulative experience of aircraft engines, and has ceased to depend in any way on racing car experience.

Indeed, on the coming of peace, doubtless it will be found that the position has been wholly reversed. In the future not a little of racing car engine design may derive from aircraft engine practice.

DESIDERATA IN AIRCRAFT ENGINE DESIGN.

To approach the problem from the correct point of view, we must recognise that the outstanding desiderata in designing aircraft engines to-day may be summarised thus:—

- (a) Light weight, combined with low fuel and oil consumption, per horse-power.
 - (b) Reliability.
- If we can but attain those characteristics with units of not less than, say, 200 h.p.—better still, if we can exploit them in units each up to 600 h.p.—then we can afford more or less to neglect other desiderata as being of minor importance. Nevertheless, happily we can already go a far way towards realising what we might style the minor desiderata, which at this period of the war include:—
- (a) Simplification to the utmost in fact of these engines being placed, for the most part, in the hands of a great number of semi-skilled men in even flying and maintaining them.
 - (b) Foolproof as much as possible in that some of the most daring Service fliers either have not the temperament or the understanding to spare the engines of which they are part in charge.
 - (c) Accessibility, in face of the frequent attention needed by all aircraft engines and of the fortunes of war rendering it necessary on occasion to replace the most vital parts.
 - (d) Standardisation, because for the first time in the story of motor engineering we are making engines of high output in series in place of about half a dozen at a time.
 - (e) Suitability of exterior form, that the power plant may be accommodated conveniently in the aircraft and occasion the minimum displacement.

INFLUENCES ON THE AIRCRAFT CONSTRUCTOR OF THE PARTICULAR EMPLOYMENT.

Thus there are strict limits to the size of radial engines, whether of the rotary or of the stationary type, which it is profitable to employ for aircraft work; while in regard to the vertical, or to the V-shaped engines, the nature of the particular service to which each individual engine is to be put likewise imposes certain limits.

In certain cases strict limits must be set to overall length of the engine, particularly at a time of war in the air, when, at need, it is essential to lose the minimum time in altering the flight path of a machine from a diving attitude to a very steep climbing one. Again, some sorts of aircraft call for the minimum engine head resistance, but are less imperative to overall length; hence the six-cylinder type would be suitable for such service, whereas the V-shaped variety would not be.

UNIFORMITY OF CERTAIN CHARACTERISTICS.

In other words, at this period it is impossible to lay down any arbitrary rules as to any one type of aircraft engine being suitable for the needs of all aircraft service. Those needs are almost as various as are the demands for special varieties of steel and of alloys. Moreover, they are likely to multiply with the lapse

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of time. Yet between the widest varieties we perceive the essential characteristics of demand to be uniform. This is a great gain alike to the designer and to the manufacturer on the one hand and to the Services on the other.

It means that when the right scheme of design is evolved, the least possible disturbance is caused in the given factory, though it be concerned with producing power plant of various size, weight, and horse-power output. Therefore the maximum production can be attained, while the problems of management and repair are correspondingly reduced to the minimum. Interchangeability can be exploited to the maximum, and once the mechanics and pilots have mastered the principles of whatever system of construction is in question, it is found that those principles are applicable to all varieties of the given system of construction.

DEMAND IN A STATE OF FLUX.

When we come to systems of construction, again there can be no laying down of hard-and-fast rules, for the sufficient reason that the suitability or otherwise of systems are predetermined by the demands of the aircraft constructor and the aircraft user, which demands are ever varying. Therefore what system may be the most suitable thing possible to attain in satisfaction of the demand of to-day is not necessarily the principle on which to work for satisfying the demand of next year or of five years hence.

Hence, while we may make bold to criticise the suitability of this system or that to satisfy the insistent demand of the hour, we must have a care not to be drawn into the making of sweeping assertions about the practicability of any system of construction for the necessary nebulous needs of the future.

DIFFERENCE BETWEEN MIGHT BE AND MUST.

Probably it is little realised that if the aircraft engine designer had not to think of the means at present available to the manufacturer, nor of the time factor, nor of those to whose tender mercies the standardised product will be submitted, he would produce very different designs to fulfil any given purpose from those he evolves to-day.

Aircraft engine design resembles motor car engine production in this particular, that it is all the time a question of compromise. The most successful designer is he who exercises the soundest judgment in weighing a hundred and one factors of the hour and who gives the shrewdest estimate of the relative value of each.

THE NEWS OF THE HOUR.

Having thus striven to give a notion of what one might style the psychology of aircraft engine designing at this or any period, let us take some of the governing factors of to-day somewhat more in detail. It is not deemed desirable, therefore, it is not proposed, to give in a paper of this sort particulars of any engines such as are being, or are about to be, used by the Services in this war. Instead, it is held to be preferable to review with more or less detail the points that have received most attention in the development of the design of the latter-day aircraft engine.

THE THREE MAIN SPRINGS.

In regard to the general arrangement of aircraft engines, there are several main types, each of which involves advantages as well as disadvantages. The business of the designer is to effect the best compromise possible to fulfil the particular class of service that is had in mind in scheming the individual engine.

Of course, multi-cylinders are common to all types of aircraft engines. But the arrangement of the cylinder groupings and settings differs entirely as between one type and another. Doubtless, the most generally favoured form is the V-type with either 12 or eight cylinders per unit, these being set in two rows on a common crankcase whereby one crankshaft suffices because one crankpin serves for each pair of opposed cylinders.

Undoubtedly next in order of importance is the radial type, in which the cylinders are set in one or more planes with axes radiating from the centre line of the crankshaft.

The two sub-divisions of the radial type of engine are the rotating and the fixed variety.

What we may style the straight-line engine constitutes the third main type of engine. In this four, more generally six, and, in a few examples, even eight cylinders, and 12, are placed in a line and are set vertically on a crankcase, the pistons and connecting rods acting on a crankshaft with one crankpin per cylinder in the orthodox fashion of motor-car engine practice.

THE SPHERE OF UTILITY OF EACH TYPE.

Inasmuch as each of these three types has advantages peculiar to itself, it follows that each is the most suitable so far available for some particular form of aircraft. For instance, the cross-section or wind-resistance area per horse-power is least in the straight-line engine and most in the rotating radial type. This includes the loss of power necessary to rotate the engine. The fore and aft length of the engine, however, which is of great importance in some aircraft, is least per horse-power in the case of the rotating radial type, and greatest per horse-power in the straight-line engine.

Moreover, when the straight-line engine is water-cooled, as is generally the case, the rotating radial type gains a further advantage on the score of decreased weight per horse-power. Against this, however, the economy of fuel and oil consumption which can be obtained with the straight-line water-cooled engine is appreciably greater than is possible with the rotating air-cooled type as designed to-day.

Somewhere between the two contrasted types of engines as regards the problems of wind resistance and overall length is what is styled the V-type of motor, wherein weight per horse-power is lighter than in the straight-line engine, owing, of course, to the proportionately much greater crankshaft size in relation to the number of cylinders employed. But if we consider the case of the air-cooled V-type engine, under the score of weight per horse-power, of course, it has to yield place to the rotating radial type.

UNUSUAL TYPES.

Yet another type which the author has produced and standardised during the past year with highly satisfactory results is a development of the V-form of engine in which more than two rows of cylinders are placed on a common crankcase. The particular engine had in mind employs three rows, each of six cylinders, on a common crankcase, each crankpin being connected to three pistons by articulated rods.

In this 18-cylinder unit the centre lines of the cylinders make, in relation each to the other, an angle of — degrees. This allows of a very good firing diagram. This type of engine is one that is considered very promising for units of very large power. As regards weight per horse-power, it has advantages over both the V and the straight-line types of engines.

A further development of this design, in which the rows of cylinders are increased, brings us to the consideration of the fixed radial engine, which, in the author's mind, is one that has been sadly neglected. He feels that we shall hear a deal more about it in the near future. Several forms of these engines have been designed and made, but it may be said, in broad terms, that the success of them does not yet appear to be as great as we should be led to anticipate from consideration of the possibilities of this particular form of design.

The question of head resistance might be raised in regard to this engine, in that, when many cylinders are used, the diameter of the projected area of the power plant is increased.

SUITABILITY OF FUSELAGE SECTION.

In the case of most single-engined aeroplanes or seaplanes a fuselage of circular cross-section is admirable. It can be made large enough to accommodate the fixed radial type engine without increasing unduly the head resistance of the machine.

This is not so, however, in the case of multi-engined aircraft, in which the power plant units are placed away from the body of the machine. In these cases increase of head resistance above the minimum necessary for each power unit is the greatest disadvantage; therefore, its avoidance is of vital importance. Hence, for multi-cylinder aircraft the straight-line type of engine is the more suitable, particularly as the power per unit at present demanded by the builders of these machines is well within the compass of types that have been produced on the principle wherein the cylinders employed are set in a single row vertically on the crankcase.

In the circumstances in which we meet in mid-campaign it is not possible to state definitely the size of engine which is most likely to be adopted as standard in the near future.

INFLUENCE OF SERVICE EXPERIENCE IN MODIFYING DESIGN.

A particular effect of the war on the evolution of aviation is the rapidity of the advance which has been and which continues to be made in the design and production both of aircraft and of engines for them. Compared with the average of enterprise in normal times, the amount of experiment that has been carried out in these directions during the last year or two is amazing, and the practical results obtained are correspondingly important.

In the author's factory experimental work is held to be of vital importance, in that the discovery of anything that gives advantage over any feature of previous practice is essential for the improvement of the product standardised. Doubtless, this accounts for the rapidity with which changes are made in details of design, also for the fact that the whole question of design is vastly more in a state of flux than the lay mind imagines.

Further, the experience gained by our aviators since the beginning of the war, together with the demand for the engineer to meet their ever-growing needs, have called for continuous evolution in the design of aircraft, all of which has inspired corresponding enterprise in regard to engine construction and production.

THE PROBLEM OF WEIGHT.

With regard to the question of weight, the purpose for which the particular aircraft is required is of prime importance. Obviously, in the case of the engine in a machine designed for short flights only, the consumption of fuel and of lubricant is of less importance than the weight of the engine itself, whereas in the case of the heavier sorts of aircraft with which flights of



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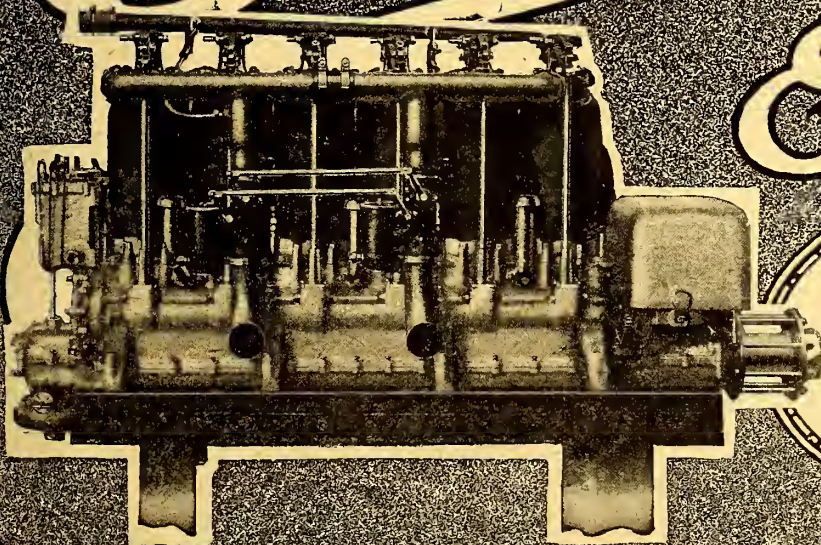


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long duration are obtained and for which great power per engine is needed, the consumption assumes much more importance than the actual weight of the engine.

In these latter cases efficiency as regards the weight of the power unit has to be arrived at by taking the weight of the engine complete with the amount of fuel and oil that would be consumed in the course of a flight of, say, five or six hours' duration. Thus for short flights the rotary type of engine generally and the air-cooled varieties are apt to show up to advantage, though in them consumption may be comparatively high, because this is offset by the relative lightness of their starting weight.

From several papers that have been read recently with reference to aircraft engines it is evident that, speaking broadly, as regards weight per horse-power, progress in the design of the ordinary water-cooled type is very marked. To the author's own knowledge, in the brief period of two years there has been obtained with this type a reduction in weight from 4.3 lbs. per horse-power to 2.16 lbs. per horse-power.

It follows that in designing aircraft engines a variety of points have to be considered with extreme care concerning which the builder of an engine for ordinary car service is not forced to take much trouble. This difference is rendered necessary, firstly, by reason of the amount of material employed, and secondly, on account of the comparatively light weight of the aircraft engine complete.

VALVE DESIGN: THE INTERMEDIATE STAGE.

The design of the engine head, the cylinders, the valves, and the valve gear is one of the cardinal features of successful aircraft engine production. Car engine design allows of the employment of the L-shaped head, or, in some cases, even of the T-shaped type, though the latter is not used to any great extent to-day for automobile vehicle practice. Undoubtedly the L-shaped head has given excellent results in aircraft engine practice in the past, but the author prefers to consider that such examples really represent an intermediate stage in evolution and that they stand rather for modified or adapted car engine design than for aircraft engine design proper.

In point of fact, high efficiency is got with this type of head only by the use of a special design of valve cap that makes provision for the maximum surface of the engine head being served with water by the cooling system. In other words, you employ a form of duplicated valve cap, the removal of the upper and outer member of which reveals a space for water to circulate beneath it when the engine is working. At the bottom of that water is the valve cap proper. Further, to get the best results, it is needful to machine as much of the surface of this transition type of engine as possible.

THE NUMBER OF VALVES PER CYLINDER.

For standard car work one exhaust and one inlet valve per cylinder have sufficed for general practice to date, whereas present-day demands on aircraft engine designers are so great that any attempt to attain the requisite degree of efficiency by further exploiting such a scheme of design would lead inevitably to failure.

The necessity for running aircraft engines for long spells at either the maximum or a very high output without impairing the efficiency of the machine by distortion or pitting of the valves which assuredly would occur with the ordinary design employed for car service, and so forth, has compelled the devotion of much thought and a wealth of experiment to the problem, as a result of which it appears to be accepted as established that the multiple valve system is a necessity.

In this connection, to achieve maximum output, the author favours two exhaust valves per cylinder and two inlets.

The horse-power obtained by engines designed on this principle and now standardised would appear to justify this conclusion. For example, a six-cylinder engine embodying this feature of valve design and having a cylinder bore of 81½ mm. with a piston travel of 156 mm., develops 135 h.p. at 3,000 crankshaft revolutions a minute. That is equivalent to a mean effective pressure of 134 lbs. per square inch. At 2,000 crankshaft revolutions a minute it represents a duty of 21 h.p. per litre capacity.

Among the advantages of the four valves per cylinder scheme are that a good shape of engine head is obtainable with it as well as the best sparking plug position, because that is in the centre of the head in a vertical position. The inclination of the valves necessary for putting them into place allows of ample water-jacket space being provided round each valve and at the base of the sparking plug.

THREE PRACTICABLE, MORE THAN FOUR UNDESIRABLE.

Judged by achievement to date, any other combination of valves per cylinder will not give quite the same degree of efficiency. Take such variants as three valves per cylinder on the principle of two exhaust and one inlet valve. While giving perhaps a better-shaped, because circular, head that can be machined practically all over, this combination practically precludes any other sparking plug position than in the side of the barrel. For obvious reasons, such an arrangement has many disadvantages. Never-

theless, three valves per cylinder scheme gives quite notably good results when exploited in certain ways and for certain special purposes.

This may be judged from the fact that the diameter of the inlet valve can be made large enough to-day to give about — h.p. per litre capacity at 2,000 crankshaft revolutions a minute without involving serious trouble, such as would arise from heat effects, and so forth.

The use of more than four valves per cylinder is undesirable. It seems hardly possible to place them efficiently, leaving an even jacket all round each valve, without the employment of very complicated gear. We have an example of this in the Maybach engine, which has three exhaust and two inlet valves per cylinder. In this scheme little water space is provided between the valve seats, while the sparking plug is, besides, set horizontally in the side of the cylinder barrel.

Undoubtedly in any type of engine it is a gain when the surface of cylinder head can be machined. This is not possible, however, with the four valves per cylinder design. Hence in that case a compromise is achieved by making the surface as small as possible and by finishing it as much as possible by hand with files, scrapers, and so on.

THE MATTER OF MATERIAL.

In regard to the material of which the cylinders are fashioned, a tribute is due to the metallurgists and manufacturers on account of the great improvement in the cast iron available for cylinders of recent years, the very high tensile and good ductivity qualities of it being particularly notable.

Of course, the advent of aluminium alloy as a material for cylinder castings marks an important stage in the advance of aircraft engine design and production, the rate of progress obtainable by the designer being determined primarily and always by the materials that are available to him. A series of experiments carried out by the author over a period of more than twelve months has proved the superiority of aluminium alloy for this work. It has established the fact that it can give completely satisfactory results when the precisely right alloy is handled with knowledge and is employed on tested designs. Thus a 12-cylinder aircraft engine of 92 mm. bore and 135 mm. piston travel has run at full power for 100 hours without an involuntary stop or untoward incident, otherwise with complete satisfaction.

With that sort of confidence which is founded on reason, as the result of cumulative experience on the one hand and further research on the other, particularly with a view to rendering these special alloys capable of being cast easily in the factory, we may look for both speedy and consistent improvement in those varieties that will be available for this highly specialised work. Though we are merely on the threshold of realising the possibilities of aluminium alloys for cylinder castings, it cannot be doubted that within a brief period they will be recognised as the standard materials for this work, cast iron being discarded in favour of them.

PROGRESS IN CASTINGS AND ALLOYS.

The importance of the matter is realised by the aluminium founders of the country. It is encouraging to note the relatively great amount of enterprise being displayed by them in this connection. At the present time the more important aspects of the case embrace the effect of heat on the strength of the given alloy as well as the coefficient of expansion of it.

In the manufacture of aircraft engines more and more use is being made of aluminium alloys of varied analyses, each to suit some particular condition of work. With a continuance of advance in knowledge of heat treatment, and so forth, there is no gainsaying that this material will be employed for aircraft engine construction to a greater and yet more great extent.

ALUMINIUM ALLOY PISTONS.

Under this head it falls to be observed that for about two years the author has standardised aluminium alloy pistons with excellent results. Even when they have been made with a green sand core no trouble can be said to have been experienced with them.

A point to note, however, is that the greater clearance needed when the aluminium alloy piston is cold represents a disadvantage in comparison with cast iron pistons, and one which has not yet been overcome.

SPECIAL ALLOYS IN PLACE OF GUNMETAL FOR OIL PUMP.

Another special alloy is being used in place of gunmetal for the construction of the oil pump employed for the forced feed lubricating system. These details are of the gear-wheel type. As regards both strength and bearing qualities the alloy employed has proved to the full as satisfactory as the gunmetal used formerly.

PROBLEMS PRESENTED BY NEW MATERIALS.

Before quitting the subject of materials in general, at this juncture it will be convenient to pass the general situation in rapid review. Manufacturers have been called on to make immense efforts in the matter of supplying a wide variety of materials for multi-cylinder aircraft engines. They have met and mas-

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tered right ably the usual sequence of difficulties that materialise whenever man attempts to break fresh ground.

In particular, the high tensile steel stamping now being supplied, for instance, for a six-throw crankshaft for a 500-h.p. aircraft engine, and so forth, is a splendid example of the steelmakers' craft to-day. There would have been no call for it had not the advent of war made it necessary on a sudden for us to standardise in these islands aircraft engines of high output.

Of course, the necessity for using unprecedentedly high-class materials for these constructions has presented alike metal makers and alloy producers, as well as the engine makers' machine shops, with a series of fresh problems which have had to be overcome detail by detail before it has been possible to obtain that degree of success which is necessary ere any given product can be regarded as a practical proposition.

Briefly, there has had to be an all-round improvement in method; more scientific control has had to be exercised and procedure elaborated; while, of course, the last link with rule of thumb method has been broken in our factories by the coming of the standardised aircraft engine of proportionately great power output per unit.

Obviously, there has been a call for devoting the greatest attention to detail, since it will not suffice merely to employ more expensive workmanship and higher grade materials. In regard both to design and to procedure, each part must be accorded, besides, greater attention to detail than any that has sufficed for car engine and production to date. In what direction this extra study is needed is discovered, of course, by the laborious process of experiment.

After that knowledge has been attained, when it comes to standardising practice in the shops, very special attention has to be given to avoid points likely to start flaws. At this stage these are a prolific source of trouble in the production of aircraft engines. Each man has to be trained to give the correct proportion of attention to the various details of his job; therefore a more highly skilled class of labour is needed.

Your individual worker must know precisely what function his particular task and the part which he is engaged in fashioning plays in the scheme of the complete and, necessarily, at present somewhat complicated aircraft engine. Though only a matter of lightening, such details as boring parts, with which the car engine builder is not concerned, have to receive more than ordinary intelligent and conscientious attention during manufacture.

CONNECTING ROD FORMS.

Of course, both the radial and the V-type aircraft engine have introduced problems of design, the solution of which does not appear to be unanimous yet. In these varieties of engine design you have more than one piston attached to one crankpin. The diversity of opinion concerns the means by which this is done. Naturally, the design of eight- and of 12-cylinder standard engines for car service, such as our American friends are producing in large quantities, does not call for the same amount of care in this regard that is essential in the case of the more heavily loaded aircraft engine.

The original form was that in which the end of the subsidiary connecting rod is mounted on the outside of the main connecting rod. This, however, makes relatively a very heavy big end not suitable for engines from which is demanded the high duty necessary for aircraft service, as the wear of the big end is controlled by its weight and oil pressure.

A lighter construction is achieved by the link-rod method, wherein the subsidiary member is attached to the main one by a pin placed so near the centre of the crankpin as possible. This arrangement has the additional advantage of rendering it considerably simpler to take up any wear in the big end bearings. For obvious reasons, in the former type that operation is not a very easy one.

The latter type, however, introduces a further problem. Owing to the centres of the bottom pins of the subsidiary rods not being coincident with the centres of the main pins, the movement of them is along an elliptical path in contradistinction to that of the crankpin, which, of course, is circular. The ellipse has the effect of altering the stroke of the piston attached to the subsidiary rod. The extent of the variation depends on the angular position of this pin with the centre line of the main connecting rod, the distance from the main pin to the rod pin remaining constant.

THE LESSER OF TWO EVILS.

It will be readily appreciated that the length of the piston travel can be corrected by tilting the axis of the ellipse in such a manner as to give the precise stroke desired. Owing to its change of velocity, also to its greater stress on the main rod due to the reversal of that rod during the firing stroke, this would have the further effect of altering the acceleration of the piston attached to the link rod. In going into this question the author came to the conclusion that the alteration of the stroke was the lesser of two evils.

The design adopted in certain radial engines, in which gear-wheels are used to maintain the correct position of the link-rod

pin, is a very clever method of overcoming these difficulties. Nevertheless, it makes for relatively heavy construction and tends to provide a further cause of mechanical failure.

In the case of the three-row 18-cylinder — horse-power Sunbeam-Coatalen aircraft engine, the design of connecting rod arrangement in regard to the link pin details is such that the centre row of pistons that are attached to the main rod of each series have a travel of 160 mm., while each of the pistons of the two side rows of cylinders has a stroke of 168 mm.

As it is essential to employ as light a connecting rod arrangement as possible, the question of loads on the bearings becomes of great importance.

Despite the fact that one engine of great power has been designed with balance weights, and has certainly given satisfactory results as standardised, and that, of course, these can be used in car practice, nevertheless, such accessories are practically precluded in the case of the latter-day aircraft engine on consideration of the weight per horse-power of the given engine.

LUBRICATION.

As has been indicated, lubrication is prominent among the matters that illustrate the difference between car and aircraft engine design and practice. While everything possible is done to reduce the bearing pressure in the aircraft engine, nevertheless, in practice, it is found that the best design is one in which less bearing surface is allowed than obtains in the case of the car engine. This is rendered practicable in the aircraft engine by giving more careful consideration to the problem of lubrication. Thus a pressure in the oil circuit up to 100 lbs. to the square inch is being used. This ensures an excellent condition of bearings, while the design of the oilways in the bearings themselves is such as to prevent excess of lubricant getting to the pistons.

Because an aircraft engine has to carry its supplies of lubricant aboard the machine, obviously it is only less desirable to ship an excessive amount of oil for any given flight than it is to carry too little. Moreover, the fact that the engine bearing pressure is much higher than in motor-car practice, and as much more heat is generated and has to be absorbed by the film of oil on which the lubricated surfaces are floated, renders it impossible to carry the oil in the base-chamber, as in ordinary motor-car engine practice. In aircraft engine design you aim at achieving the maximum economy of lubricant consumption in combination with maintaining effective pressure in the system by preventing the oil becoming too hot and thereby losing its viscosity.

Therefore, you design an aircraft engine with what is styled a dry base-chamber, placing the oil supply in a tank set somewhere else in the machine, probably in the slipstream of the propeller, so that it may be exposed to the maximum draught, and its contents cooled as rapidly as possible, to be served again to the engine by the intake pump in connection with the pressure system. The relief valve returns all excess oil to the tank and the expelling pump at the bottom of the base-chamber withdraws all the lubricant that, having escaped through the connecting rods and served the details that are ciled by the splash system, returns as filtered residue to the tank, where it is cooled as quickly as possible, and, therefore, made ready to be passed into the engine system again.

Experiment has proved that for a long run under full load it is necessary to force the oil through some sort of cooler placed in the air-stream in a similar way to the radiator. Likewise the design of base-chamber must be such as to act as a cooler of sorts for the oil passing down from the crankshaft and other details to the pump. Of course, the high pressure to which reference has been made is needed in connection with the main bearings, the crankshaft, and the connecting rods only.

In this regard a great advance has been made recently by providing a supplementary pump of small capacity which serves to lubricate the minor parts of the engine that do not need high pressure. This ensures that these minor parts get each a proper proportion of lubricant without supplying it at the possible expense of the main bearings and without receiving an excess supply which might make a dirty engine.

POINTS ABOUT COOLING.

From lubrication we pass to its obvious corollary, cooling. Considerable divergence of opinion still obtains among engine builders and radiator makers concerning water-cooling. The author is of opinion that, because increased flow of water would allow of the employment of a smaller radiator surface, that line of development is likely to be considered in the near future.

Another important matter concerns the rendering adjustable of the cooling capacity, or the surface, to suit variations of climatic conditions and of altitude. Assuredly, this is highly desirable. The conditions under which aircraft are being used to-day render such a development well-nigh imperative. The use of radiators of relatively less size, such as is to be expected from speeding up the flow of water, should afford a notable advantage in this particular connection.

It is to be noted that air-cooling is coming into increasing favour. The introduction of aluminium alloy in the manufacture of the cylinders has exercised a marked effect in regard to this ten-

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PLANES

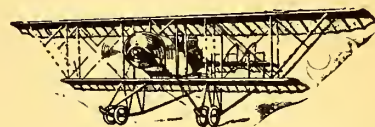
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gency. It would appear, however, that to date relatively very little has been done with multiple-valves as applied to air-cooled engines.

Yet in the matter of the advantages of employing multiple valves to the number of four per cylinder it would seem that the gains of this system as applied to water-cooled engines should obtain equally in the case of the air-cooled varieties. Further, the small valve is likely to give more satisfaction in air-cooled than in water-cooled engines by reason of the time factor in the conductivity of the heat from the individual valve to the adjacent parts of the cylinder. For these reasons, among others, in the near future air-cooled engines of larger power may be expected to materialise. Certainly this type is very promising.

CARBURATION AT THE CROSS ROADS.

As applied to aircraft engines, the proposition of carburation stands to-day somewhat on a basis of compromise. For this reason experiments now being carried out are directed towards obtaining more efficient and economical carburation. The tests made on Sunbeam-Coatalen aircraft engines at the manufacturers' works at Wolverhampton have shown a petrol consumption of 0.52 pints per horse-power per hour, coupled with an oil consumption of 0.04 pints per horse-power per hour. It will be readily agreed that this stands for a distinct advance on consumption by engines using ordinary type carburettors so recently as at the beginning of the war.

Nevertheless, there is room for a deal of improvement yet. Perhaps this is not so much from the maker's point of view as from the pilot's. One refers more particularly to the supply of petrol to the carburettor itself, for instance, when the aircraft is rising rapidly or stalling. In the case of military aircraft, particularly, there arises the problem of carburation, while the attitude of the engine is being varied in all manner of directions owing to the manoeuvring necessary while fighting an enemy.

ANTICIPATED GREAT ALTERATIONS IN DESIGN.

When this war began there was relatively little fighting in the air, and the average flying was done at anything from 4,000 to 6,000 ft. To-day our airmen rarely go over the lines at less than 16,000 ft., and fighting has taken place certainly at altitudes of 21,000 and 22,000 ft. Accordingly it will be realised that at the outset of the campaign the problem of altitude was not thrust to such an extent on the attention of the designer and the manufacturer because such modest heights were deemed sufficient for aerial reconnaissance and other work, whereas in the interval it has become imperative to navigate the air at such vastly increased heights that the difference in atmospheric pressure can be ignored no longer for the sufficient reason that the altitudes in question could neither be attained nor maintained if the problems presented had not been solved, at least in part, already. They concern both carburation and engine compression, as well as the matter of cooling. As to carburation, the influence of altitude is quite the most important consideration.

FORCED INDUCTION AND INCREASED COMPRESSION.

In dealing with the situation the correct line of attack would seem to lie in the direction of forced induction, though under present conditions perhaps it were unwise to state the manner in which experiments are being carried out towards this end. Suffice it that the problem is abundantly obvious and that great alterations in design are to be expected. Doubtless they will mark yet another point of very great divergence of design from that employed for engines for car service. It is beyond dispute that in the near future the two types must become more and more pronouncedly contrasted.

The method of increased compression exploited for Zeppelin service as a means of tackling this problem is peculiarly suitable for airships owing to it not being necessary for those craft to climb by mere engine power, also to the fact that a major part of their work is done at high altitudes.

It is possible that the engines in which small change in atmospheric pressure is allowed for are used entirely for work at high altitudes, and have a much higher compression than those which are employed for manoeuvring Zeppelins near the ground.

Of course this question of compression is interconnected with the problem of carburation; hence we must also regard altitude as a governing factor in the design of the latter-day aircraft engine. In the last few years considerable advance has been made in the degree of compression standardised successfully. Thus engines with a compression ratio as high as 6 to 1 are running satisfactorily at sea-level to-day. That, however, has been rendered possible only by evolving such a combination of features as valves of suitable design, diameters, and openings, and by going very scientifically into the matter of cylinder head design.

THREE YEARS' PROGRESS AT A GLANCE.

Assuredly it is interesting to compare present-day achievements with results of, say, three years ago, as instance those obtained at the Naval and Military Aero-Engine Competition in 1914. As a result, it will be found that then the use of aluminium was practically confined to the crank case only; its application to the construction of pistons and other small parts of the aircraft engine was not known.

Further, we find that the maximum mean effective pressure was approximately 106.5 lbs. per square inch, and that the average fuel consumption was 0.6 pints per h.p. per hour. The weight of the engine with fuel for a run of five hours' duration varied from 7.3 in the case of the rotary air-cooled variety to 11.9 in that of the vertical water-cooled type.

By contrast, to-day the mean effective pressure standardised has been increased to 134 lbs. per square inch, measured from the brake horse-power and, in some cases, actually through the reduction gear. At the same time fuel consumption has been reduced to 0.52 pints per h.p. per hour, while the weight of the V-type water-cooled engine has been brought down to 5.36 lbs. per h.p. per hour with fuel and oil for a five hours' effort, all of which the author holds to represent a notable rate of progress.

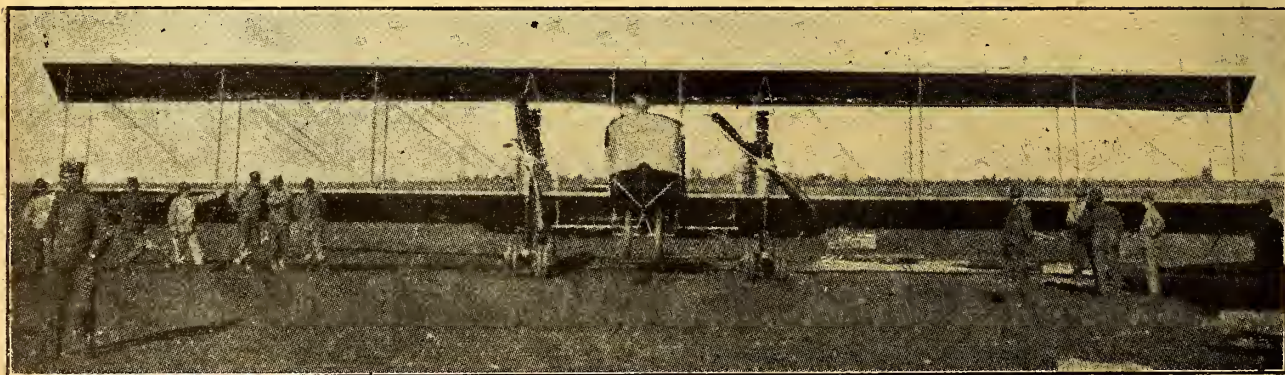
METHOD OF RATING.

From the inception of the movement several methods have been proposed for rating petrol engines. At the stage at which we have now arrived in constructing power plant for aircraft service some figure seems to be needed which will give a notion of the efficiency, or horse-power output, of an engine in relation to its size. To-day the mean pressure is used often for this purpose; but in the author's view that is neither convenient nor can it be arrived at easily.

For this reason he wishes to propose that the horse-power per unit capacity obtained from any given engine be taken as the standard for preparing the different "duties" of engines. Of course, the figure obtained is proportionate to the mean effective pressure, but doubtless it will be agreed that it is more convenient.

The capacity taken would be the capacity per cylinder multiplied by the number of cylinders and by the number of complete cycles per minute, but to serve the aim in view the horse-power per litre engine capacity per 1,000 cycles, otherwise per 2,000 crankshaft revolutions a minute, is proposed.

In his Presidential address to the members of the Institution of Automobile Engineers in October, 1916, Mr. Legros gave some very interesting figures comparing petrol engines by means of the equivalent radius or torque of the crankshaft divided by the weight of the given engine. In connection with the aircraft engines cited, the author has reduced these figures, and finds the results vary in the range of 18 to 21 horse-power per litre of petrol at 2,000 crankshaft revolutions a minute. He deems the latter figure the maximum likely to be obtained at sea-level with water-cooling by the present design of engine, measuring the duty at the propeller.



Reproduced from "La Guerra," the Italian Official Publication.

AN ENGINE DESIGNER'S OPPORTUNITY.—Front view of the three-engined Caproni biplane. The advisability of using vertical "straight line" engines in the fuselages of this type is obvious. The engine at the back of the central nacelle might be a big radial or a three-row "V."

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THE PATENTS INDEX.

The subjoined index of recent inventions has been specially compiled by THE AEROPLANE from the current Official Patent Records.

PATENT APPLICATIONS.

- Aeronautical Instrument Co. and Another. Ripping panels for balloons, etc. No. 6427. May 5th.
 Besson, M. M. E. Aeroplanes and Hydro-aeroplanes. No. 6171. May 1st.
 Down, T. M. Aeronautical sighting and range-finding device. No. 6070. April 30th.
 Down, T. M. Self-sealing aerofoils or planes for aircraft. No. 6071. April 30th.
 Eborn Propeller Co. and Another. Propellers for aircraft. No. 6210. May 2nd.
 Lanchester, F. W. Mechanism for receiving and launching aeroplanes at sea. No. 6153. May 1st.
 Lang Propeller, Ltd., and Another. Aerial propellers. No. 6227. May 2nd.
 Luff, W. F., and Another. Aircraft. No. 6068. April 30th.
 McGowan, A. Aeroplanes. No. 6390. May 4th.
 Merrall, W., and Another. Flying machines. No. 6201. May 2nd.
 Ransome, A. L. M. Strainers and strainer clips for aeroplanes, etc. No. 6331. May 4th.
 Tarrant, W. G. Airships. No. 6252. May 2nd.
 Thompson, W. P., and Another. Flying-machines. No. 6336. May 4th.
 Wells, R. F. Aeroplanes. No. 6215. May 2nd.
 Youlten, W. Aeroplanes, hydroplanes, etc. No. 6149. May 2nd.

COMPLETE SPECIFICATIONS ACCEPTED, PRINTED COPIES OF WHICH ARE OBTAINABLE ON AND AFTER MAY 24TH, 1917.

- 17,346/15. Dec. 10th, 1915. Page. Catch or fastening applicable generally but particularly suitable for a releasing gear for bombs carried by aeroplanes.
 100,532. May 22nd, 1915. Soc. Nouvelle des Aeroplanes P. Schmitt. Alighting and landing apparatus for waterplanes and aeroplanes.
 105,816. May 22nd, 1916. Saunt, W. F. Aerial machine.

104,105. Straining Wires, etc. HARDY, B. H., and REDRUP, A. L.

Relates to wire-strainers, specially suitable for tensioning the stays of aeroplanes, of the kind comprising a straining-lever e to the short end d of which one of the wires t is connected, the other wire a passing around the bend of the lever. In order to increase the tension when the long arm is bent back against the wire, an abutment i is provided which presses the wire b away from the lever. The arm e is formed with a detent g , over which the ferrule f is passed, and a pin or split ring is inserted through the hole h as an additional safeguard.

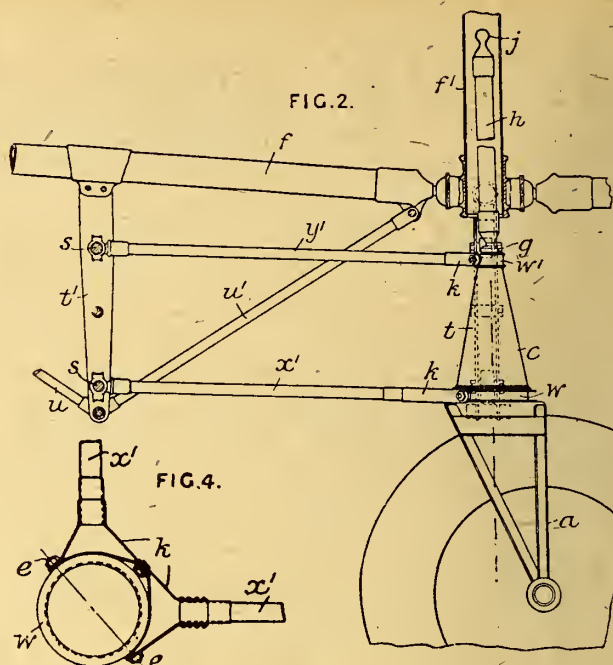
104,114. Aeronautics. KELLY, T. D.

PLANES, CONSTRUCTION OF; AEROSTATS; CARS AND CABINS.—The form of surface described in Specification 101,442 as applied to the upper sides of planes of aeronautical machines, and in which a series of pockets or indentations is provided, is applied generally to any part of an aeronautical machine other than the planes, for example to the sides of or underneath the fuselage of an aeroplane, or to the top or sides of the fabric of an airship. In the form shown, the pockets, having an abrupt descent A and a gradual ascent B towards the rear, are formed by constructing the surface of material made to overlap like the scales of a fish or the feathers of a bird. The pockets

may be constituted by angular corrugations or grooves at approximately right-angles to the direction of travel.

104,125. Aeronautics. ROYCE, F. H., DAY, B. I., and ROLLS-ROYCE, LTD.

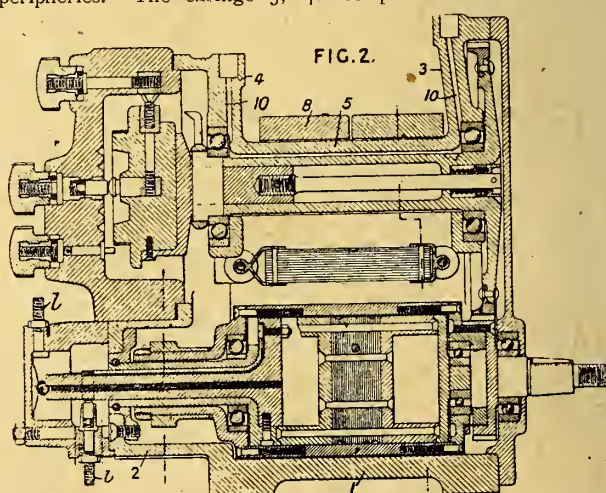
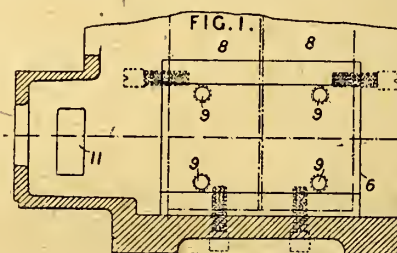
AERIAL MACHINES ADAPTED TO TRAVEL ALSO ON LAND; SHOCK OF LANDING, DEADENING.—In order to resist lateral stress, swivelling landing-wheels are mounted on the framework of aircraft by means of two pairs of radius-rods x^1 , y^1 capable of movement in two vertical planes at right-angles or approximately so. The radius-rods are attached at one end by ball joints s to struts t^1 on the framework f , and at the other end by brackets k to the head or rings w , w^1 in which the trunnion post c carrying the fork a swivels. The brackets k are hinged to the head or rings w , w^1 about axes e , e approximately parallel to the line joining the centres of the joints s at the inner ends of each pair of radius-rods. A thrust-rod h is connected at its lower end to the trunnion post c by a ball joint g , and at its upper end is coupled by a ball joint j to a suitable shock-absorber. In a modification, the upper radius-rods y^1 are dispensed with, and



the thrust-rod h is replaced by a plunger or the like guided in the tube f^1 of the framework and attached by a ball joint to the trunnion post.

104,239. Magneto-electric Machines. SALMON, E. J. J.

The base 1, the bearing-portion 2 for the armature or indicator of a magneto, the casings 3, 4 for enclosing respectively the distributor - shaft gear-wheel and the distributor contacts, and the middle part 5 supporting the permanent magnets 8 are all formed in one piece, of gun-metal or aluminium. The part 5 is of inverted-U shape and is straddled by the magnets 8, which are secured by screws 9 to pole-pieces 6. The pole-pieces are fitted in rectangular apertures in the part 5 with the metal upset around their peripheries. The casings 3, 4 are pierced with lubricating-



holes 10; an aperture 11 serves as a passage for the interrupter finger. After erection of the parts, covers are fitted in front of the parts 2, 3, 4. High-tension and low-tension terminals l , i are provided.

104,346. Aeronautics. JOHANSSON, C. A.

BALANCING.—Aircraft are stabilised by means of an auxiliary frame 7, 8 pivotally mounted on the machines and carrying rear and front planes 31, 32. The auxiliary frame is kept in a vertical position by the weight of the car 26 mounted between springs 24, 25 in frames 16 secured to the members 14, 15, which slidably engage members 9, 10 on the auxiliary frame.

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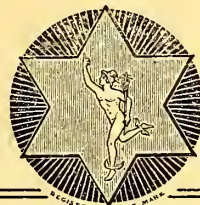


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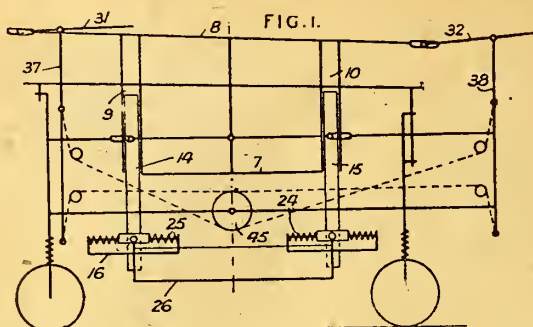


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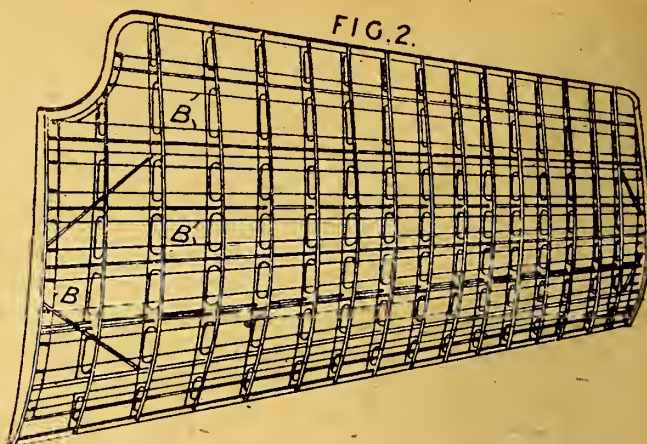
Sodbolds



The planes 31, 32 are connected to movable members 37, 38 kept in position by cords which pass over the hand-controlled drum 45. Should the machine tilt, the consequent change of speed causes a movement of the car relative to the machine, and this movement automatically restores the stabilizing-frame to its normal vertical position. The relative movement of the auxiliary frame and machine then causes a movement of the planes 31, 32 whereby the machine is automatically restored to normal position.

104,386. Aeronautics. MARCONI'S WIRELESS TELEGRAPH CO. and DOWSETT, H. M.

PLANES, CONSTRUCTION OF.—To provide increased electrostatic



capacity in aeroplanes fitted with wireless telegraph apparatus the usual internal cross-bracing wires of the wings are made electrically continuous and connected to the transmitter; or wires B, Fig. 2, may be used instead of, or in addition to, the cross-bracing wires. The wires B may be bare or insulated and are supported by lashings where they pass through slots in the ribs.

MARKET REPORTS.

Prices given are for quantities on the usual terms.

May 10th, 1917.

COPPER.—There has been no violent change in the Copper market, and the present prices can be considered fairly reasonable, Copper Ingot being £9 per ton less than the market price a year ago. Three facts are undoubtedly responsible for this position, viz.:—(1) Increased output of the mines, (2) Reduction of demand, due to the elimination of Copper, where possible, and the use of other metals. (3) The enormous amount of scrap Copper which has been put on the market for resale, primarily due to the strict control which is being exercised.

Current Prices.

Copper Ingot (Standard) ...	£130 Cash.
Copper Sheet ...	£165 per ton.
Copper Tube ...	20½d. per lb.
Brass Sheet, 24 gauge ...	16½d. per lb.
Brass Tube, S.D. ...	17d. per lb.

TIN.—The Tin market is very firm indeed and the only notable feature this week is an increase in prices.

Current Prices.

To-day ...	£232 Cash.
Last Week ...	230 Cash.
Highest Price last year ...	205 Cash.

LEAD.—There has been no alteration whatever in prices, and the general situation remains the same. Prices cannot be considered unreasonable.

Current Prices.

To-day, A.V. ...	£30
Last week ...	30
Highest Price last year ...	36

Maximum Prices for Lead—Official.

Virgin Pig Lead ...	£29 per ton, Ex ship
Virgin Pig Lead ...	30 per ton, Ex works
Scrap or Remelted ...	76 per ton, Ex Seller's Address.
Sheet Lead ...	39 per ton D/d.

STEEL.—There is very little to report this week, although there are rumours of a general advance in prices, and this is more than likely. Many firms making aircraft fittings have had considerable difficulty with the Steel to R.A.F. Specification 1E, and several firms have been instructed to use 3A Steel; this, of course, will increase the demand for the latter, and the output at present is far from adequate.

Current Average Prices.

R.A.F. 3A Steel Rounds, 36s. per cwt. Basis.
R.A.F. 1A Steel Rounds, 78s. per cwt. Basis.
R.A.F. 9A Sheet Steel, 30s. to 32s. per cwt.

ALUMINIUM.—Deliveries are now fairly regular and there appears to be ample supplies. Official prices still remain the same.

Ingots.—Official Price, May, 1917, £225

TIMBER.—The Hardwood market, and particularly Mahogany, is very strong. Some interesting figures have been issued by the Board of Trade, which indicate the tone of the market.

The imports of Mahogany and Hardwoods for the first three months ending March 31st, 1917, were 50 per cent. less than the imports for the corresponding period of 1916, whereas the value of the imports show that three months' imports, ending March, 1917, have an excess value of no less than £34 13s. 4d. over the same period of 1916.

This is very astounding, and is a splendid, although a serious, indication of the present position. Silver Spruce is still advancing, but there are ample supplies of English Ash; the price, however, still remains stationary.

Current Average Prices.

Silver Spruce, 14s. 3d. to 15s. 3d., c.f.
English Ash, 12s. to 13s. 3d., c.f.
Walnut, 2s. 5d. to 2s. 7d., c.f.
Mahogany, 2s. 1d. to 2s. 4d., c.f.

Prices are for selection and delivery.

FABRIC.—The price has been fixed although no official notification has been issued. The only comment I have to offer is to reiterate my previous remarks, viz.:—

It is quite apparent that Flax Suppliers and Weavers anticipated official control by getting their prices ready.

17C Cloth ...	29d. per yard, 36 ins.
Spaced Fabric ...	20d. per yard, 36 ins.

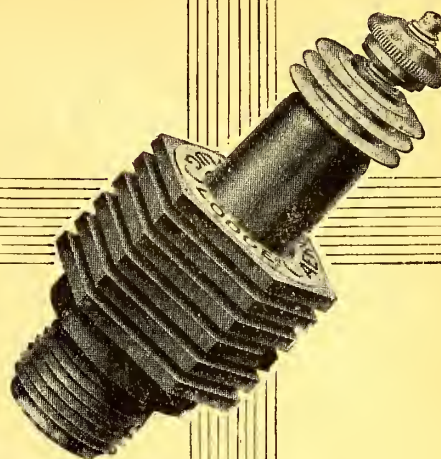
THE CONSERVATION OF TIMBER SUPPLIES.

In these days of shortage of, at any rate, the best qualities of timber for aircraft, anything which conserves timber supplies, or, as an alternative, makes it possible to use a higher percentage of the timber in stock planks, which would otherwise be unsuitable for aircraft work owing to inconveniently placed flaws, is very well worth considering by aircraft manufacturers. Therefore, one desires to emphasise as strongly as possible the advisability of investigation by all aircraft manufacturers of the McGruer system of producing bentwood hollow spars.

It would be inadvisable to describe in detail, or to illustrate, this method of producing spars, in that to do so would be to convey information of undoubted value to the enemy, but those who are concerned in the Aircraft Industry can obtain a full description and illustrations of the method from the McGruer Bentwood Hollow Spar Co., Commercial Wharf, Lambeth, S.E., and anyone, whether the head of a firm, or merely a junior draughtsman or constructor who hopes some day to be a works manager, should make a point of informing himself as to this method.

Although the word "spar" is used by the firm in its title, the use of this system of construction is by no means confined to the production of aeroplane wing spars; the word being used in its widest sense, as indicating a wooden article of greater length than thickness. The system applies equally well to masts, spars, yards and booms of ships, to oars and boathook shanks, and to poles and struts for any purpose whatsoever.

By the McGruer system of construction all short grains and crooked fibres and knots and swirls in the timber are eliminated so that the finished product consists entirely of perfectly clean and reliable wood. In hollow spars or struts built under this system a much thinner wall is possible than in the old-fashioned "dug-



C So much depends upon the infallibility of Aeroplane Plugs that too much care in their choice can scarcely be taken.

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out" spars, and, consequently, a more efficient spar can be produced. That is to say, the spar or strut will be considerably stronger for the same weight, or considerably lighter for the same strength. Moreover, the system does away with the possibilities of the timber splitting, as it is liable to do through the flat-grained side of an ordinary spar.

A minor point is also that as the timber in the McGruer system has a continuous edge-grain outwards, the surface of the spar or strut is actually less liable to surface damage than under the old system.

Any desired taper can be obtained under this system so that spars or struts can be made either straight or tapering from one end to the other, or with a curved taper from the centre to either end, and the section of the strut can be anything between circular, elliptical, oval, or what is commonly known as streamline section.

DURATION TESTS.

Samples of spars built by the McGruer system were tested some time ago at the Royal Aircraft Factory by being soaked in water at 112 degrees Fahrenheit for 12 hours on end, and they successfully withstood this very severe test. Samples have been submerged in cold water for 30 days continuously without affecting the form of the spars, or causing them to give in the joints. It is particularly noteworthy that in none of these tests were the spars varnished or protected in any way, so that it is obvious that spars and struts which were also given some protective coating would be still more durable.

Not only were these spars proved durable under water, but they have been proved equally durable in drought. Owing to the particular lay of the grain in the McGruer system, contraction due to drying takes place in the way best suited to obviate cracking in the fibres.

The tests actually made on McGruer spars are of very considerable interest, and the following disquisition will be of interest to those who are able to understand the value of figures.

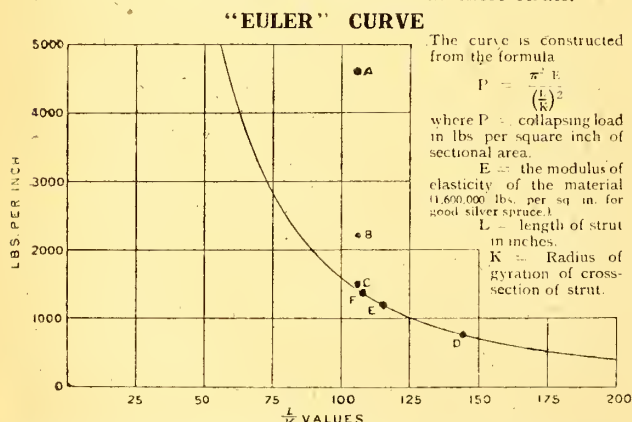
TESTS ON MCGRUEER BENTWOOD HOLLOW SPARS.

A curve of loads for struts is shown herewith which will be recognised as the Euler curve. This curve is valueless unless full account is taken of the manner of transmitting the thrust to the strut. In theory there should be no surface, but only a point between the strut and the thrust. This allows the strut to bend under the thrust. If there is any surface at all, it must be allowed for.

For instance, "A" is the result of a strut test between parallel plates; "B" is a test of a similar strut between small balls in small sockets; "C" is a test between small balls without sockets but on hard surface. This last is as near the theoretical "loose-ends" as is practicable.

"A," "B," and "C" are authentic tests on McGruer bentwood hollow spars.

The curve is only of use for long struts. Struts with an $\frac{L}{K}$ value of less than 80 must be considered as short struts.



From the Euler curve one can deduce the advantages of the relatively thin-walled spar; a type of spar now made durable by the McGruer principle.

It has been said that thin-walled struts or spars are better than relatively thick-walled spars. This does not mean that of two spars of similar external diameters—one thin-walled and the other thick-walled—that the former is stronger than the latter. It means that "per square inch of area" the thin-walled spar is better.

For instance, take three circular-sectioned struts D, E, and F. D is solid, measuring 12 ft. in length by 4 in. in diameter, parallel, having a sectional area of 12.57 sq. in., and weighing 27.25 lbs. (Spruce at 26 lbs. per cube).

E is hollow, 12 ft. by 4 in. external diameter, and 3 in. internal diameter, parallel, having area of 5.5 sq. in., and weighing on the same basis 11.95 lbs.

F is hollow, 12 ft. by 4 in. external diameter, and 3.5 internal diameter, parallel, having area of 2.95 sq. in., and weighing 6.39 lbs.

The radius of gyration (K) of D is 1; of E 1.25; of F 1.33; and the value of $\frac{L}{K}$ of each is respectively 144; 115; 108.

Referring to the curve of loads, we see that D gives 760 lbs. per sq. in.; E 1200 lbs., and F 1350 lbs.

D's absolute load will be area x 760 lbs. = 9553 lbs.

E's " " " " " 1200 lbs. = 6600 lbs.

F's " " " " " 1350 lbs. = 3982 lbs.

But if D's material were disposed as F's we should get area by 1350 equals 16,970 lbs. absolute load; and if E's material were disposed as F's we should get area by 1350 equals 7425 lbs. absolute load.

For F to be just as strong, absolutely, as D, its diameter and wall should be increased to 5.1 in. by 0.3 in. This would make the area 4.5 sq. in., and the weight 9.75 lbs., as against D's 27.25 lbs.

For F to be just as strong absolutely as E, its diameter and wall should be increased to 4.5 in. by 0.3 in. The area would then be 3.96 sq. in., and the weight 8.58 lbs., as against E's 11.95 lbs. Then the saving in weight, strength for strength, is obvious.

It can be tabulated as follows:—

	Spar D	Spar F	Spar E	Spar F
Length ..	12 ft.	12 ft.	12 ft.	12 ft.
Diameter, ext. ..	4 ins.	5.1 ins.	4 ins.	4.5 ins.
Diameter, int. ..		4.5 ins.	3 ins.	3.9 ins.
Area ..	12.57 sq. ins.	4.5 sq. ins.	5.5 sq. ins.	3.96 sq. ins.
Weight ..	27.25 lbs.	9.75 lbs.	11.95 lbs.	8.58 lbs.
Absolute Load ..	9553 lbs.	9553 lbs.	6600 lbs.	6600 lb
Weight Saved ..	—	64%	—	28%

It can be shown in much the same way that for beams of curvilinear transverse section, as, for instance, yards and booms, and oak-shanks, these spars present very desirable qualities.

Thus the moment of resistance to bending of a cross-section of a beam is represented by the formula:—

$$M = \frac{fc I}{yc}$$

Where M = Moment of resistance in lbs.

fc = Compressive stress per sq. in. of material; if weaker in compression than tension.

I = Least moment of inertia of cross-section.

yc = Distance from axis of section to extreme edge on compression side.

Then taking the three spars which have been compared as struts and comparing them as beams with the dimensions as in the above table, one finds that the thin-walled spar is the most effective.

TABLE SHOWING SPAR F'S EFFICIENCY AS A BEAM.

	Spar D	Spar F	Spar E	Spar F
Moment of inertia of cross-section	12.57	13.03	8.6	8.8
Moment of resistance of cross-section in lbs.	31425	25490	21500	19600
Comparative strength	100	81	100	91
Comparative weight	100	36	100	72
Percentage in favour of thin-walled spar	—	45	—	19

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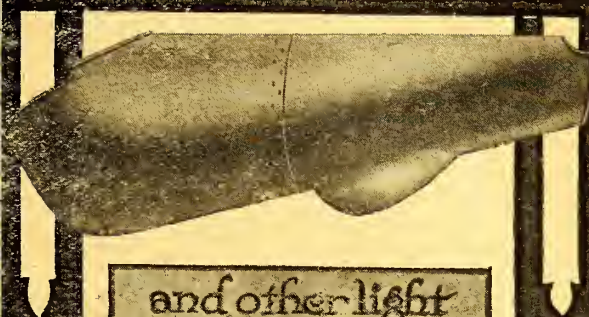
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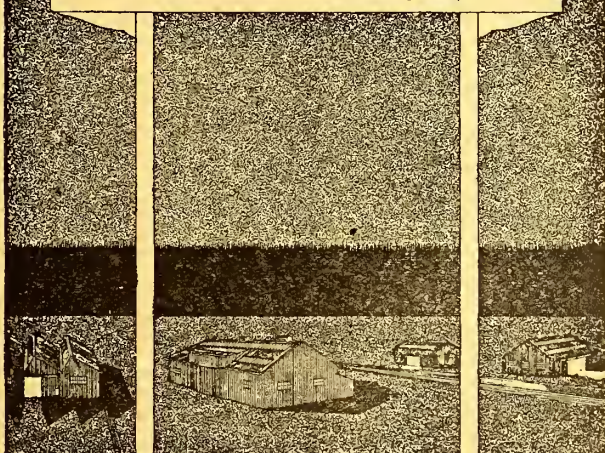
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(Continued from page 1248.)

He completed a valuable reconnaissance alone at a very low altitude and in face of heavy fire, which riddled his machine. On another occasion he, single-handed, succeeded in driving off three hostile machines.

AUSTRALIAN IMPERIAL FORCE.

Sec. Lt. Reginald Francis Bailleau, R.F.C.

Accompanied by his observer, he descended to the rescue a pilot who had been forced to land and who had set his machine on fire. He landed safely on difficult ground, and, in spite of the close proximity of the enemy, succeeded in rescuing the pilot and in carrying off his two passengers under a close and heavy rifle fire.

Lt. Ross Macpherson Smith, Aust. Light Horse R., attd. Aust. R.F.C.

For conspicuous gallantry and devotion to duty when his pilot descended to the rescue of an officer who had been forced to land. On landing he held the enemy at bay with his revolver, thus enabling his pilot to rescue the officer and safely to fly away his machine.

* * *

AMENDMENT.

The following correction is made in the "London Gazette" announcements:—

M.C. AWARD, April 17th, 1917.—Lt. George Kenneth Simpson, R.F.C., late R.G.A., Gen. List, is now correctly described.

The King has been pleased to approve of the award of the Distinguished Conduct Medal to the following Non-Commissioned Officers, for acts of gallantry and devotion to duty in the Field:—

3516 Sgt. G. J. Mackie, R.F.C.

35972 Sgt. J. F. Ridgway, R.F.C.

The King has been pleased to award the Military Medal for bravery in the Field to the undermentioned Non-Commissioned Officers and Men:—

28941 2nd Cl. Air Mech. F. Bond, R.F.C.

8124 1st Cl. Air Mech. H. Boulton, R.F.C.

32925 1st Cl. Air Mech. P. Craig, R.F.C.

17942 2nd Cl. Air Mech. J. Dunn, R.F.C.

25674 2nd Cl. Air Mech. W. Knight, R.F.C.

M.2/052233 L.-Cpl. N. McLean, A.S.C., attd. Anti-Aircraft By.

150107 Sgt. A. Morris, R.F.A., attd. Anti-Aircraft By.

61869 2nd Cl. Air Mech. E. Wood, R.F.C.

* * *

ADMIRALTY, May 12th.

The King has been pleased to give orders for the appointment of the following officers to be Companions of the Distinguished Service Order:—

Capt. Charles Laverock Lambe, R.N.

For his valuable services in command of the R.N.A.S. units on the Belgian coast; he is very largely responsible for the good service in the varied duties carried out by them against the enemy.

Sqdn.-Comdr. Geoffrey Rhodes Bromet, R.N.

This officer commanded a squadron of the R.N.A.S., attached to the [Royal] Flying Corps, with conspicuous ability and success. Under his command the squadron developed into a most efficient and formidable fighting force, which has brought great credit to the Royal Naval Air Service.

Sqdn.-Comdr. Edward Thomas Newton-Clare, R.N.A.S.

During the past year he has led his squadron with conspicuous success in numerous bomb attacks, and on many occasions has engaged and driven down hostile machines.

* * *

The King has been pleased to approve of the award of the Distinguished Service Cross to the following officers:—

Flt. Comdr. Bertram Lawrence Huskisson, R.N.A.S.

For conspicuous skill and gallantry during the past eighteen months. This officer led his flight with great courage and determination during the three months he was attached to the Royal Flying Corps, and has destroyed or driven down several hostile machines.

Flt. Lt. (now Flt. Comdr.) Arthur Dennis Wigram Allen, R.N.A.S.

This officer has done a very large amount of flying during the past nine months on fast scouts on fighter patrol work. In addition he has done a great deal of testing work at the aircraft depot. He is a brilliant pilot.

Flt. Lt. (now Flt. Comdr.) Bertram Charles Bell, D.S.O., R.N.A.S.

For conspicuous skill and gallantry during the last fifteen months. This officer has had charge of a flight during this period, and has continuously carried out most valuable work as a pilot both of reconnaissance and photographic and of fighter escort machines. His machine has been constantly under heavy anti-aircraft fire for long periods while carrying out his work.

Flt. Lt. (now actg. Flt. Comdr.) Frank Fowler, R.N.A.S.

For conspicuous skill and gallantry during the last nine months in reconnaissance, photographic and spotting machines. On the majority of occasions he has acted as pilot to Lt. Gow, R.N.V.R., his machine being constantly hit by anti-aircraft fire.

Flt. Lt. Frank Thomas Digby, R.N.A.S.

For conspicuously good work as a pilot of bombing machines. He has taken part in numerous bomb raids with successful results.

Flt. Lt. Herbert George Brackley, R.N.A.S.

For conspicuously good work as pilot of a bombing machine. Has carried out 12 raids since June 1st, 1916, mostly by night. On one occasion he returned with 40 holes in his machine.

Flt. Lt. Noel Keeble, R.N.A.S.

For conspicuous gallantry on October 23rd, 1916, when he attacked four German seaplanes and brought one of them down in a vertical nose-dive into the sea.

Flt. Lt. Thomas Frederick Le Mesurier, R.N.A.S.

For conspicuously good work as a pilot of bombing machines. Has taken part in 14 raids and numerous fighter patrols.

Flt. Lt. Irwin Napier Colin Clarke, R.N.A.S.

For conspicuous good work as a pilot of bombing machines. He has taken part in 17 attacks with good results, in addition to carrying out numerous fighter patrols.

Flt. Lt. Robert John Orton Compston, R.N.A.S.

For conspicuous skill and gallantry during the past nine months, in particular when attached to the Royal Flying Corps, when he had numerous engagements with enemy aircraft, and certainly destroyed one.

Flt. Lt. William Edward Gardner, R.N.A.S.

For conspicuously good work as a pilot of a bombing machine. He has taken part in 17 raids and numerous fighter patrols.

Lt. Russell William Gow, R.N.V.R.

For consistently good work when acting as observer, being responsible for many valuable photographs; also for his good work in connection with artillery spotting. His machine has been hit on many occasions by anti-aircraft fire.

Flt. Sub-Lt. Philip Sydney Fisher, R.N.A.S.

For conspicuous skill as a seaplane pilot during the last nine months. Has carried out many valuable reconnaissance patrols and several bomb attacks with good results.

Flt. Sub-Lt. Douglas Alexander Hardy Nelles, R.N.A.S.

For conspicuously good work as a pilot of a bombing machine. Has taken part in 17 raids, and has also done a large amount of fighter patrol work.

Flt. Sub-Lt. Ernest John Cuckney, R.N.A.S.

For conspicuous gallantry and ability when taking part in a raid on the seaplane station at Zeebrugge.

Flt. Sub-Lt. John Edward Sharman, R.N.A.S.

For devotion to duty during long-distance air raids. On one occasion, after leading a flight in the morning and returning safely, he volunteered and flew a bombing machine with a second flight in the afternoon, again acting as leader.

Flt. Sub-Lt. Walter Ernest Flett, R.N.A.S.

For conspicuous gallantry during an air raid. Shortly after leaving the objective he was engaged with three enemy machines—two single-seaters and one two-seater. His gunlayer, Air Mechanic, 1st Grade, R. G. Kimberley, was slightly wounded in the wrist, which numbed his hand. Notwithstanding this, he succeeded in bringing down two of the enemy machines, being again wounded by an explosive bullet in the ankle. The machine was riddled with bullets, and owing to the damage navigation was most difficult, and the return journey was very slow. Consequently he was again attacked, but although the gunlayer was twice wounded, the enemy machine was driven off.

* * *

The King has further been pleased to approve of the award to the following officer of a Bar to the Distinguished Service Cross:

Flt. Lt. Ronald Grahame, D.S.C., R.N.A.S.

For conspicuous gallantry during raids on the seaplane station at Zeebrugge. On one occasion he descended to 600 ft., and on another occasion to 300 ft., before releasing his bombs. (Award of D.S.C. was announced in "Gazette" dated Oct. 25th, 1916.)

* * *

The following awards have also been approved. To receive the Distinguished Service Medal:—

P.O. Mech. Walter Laurence, O.N. 300142; P.O. Mech. Frederick Henry Winstone, O.N. F570; C.P.O. Mech., 3rd Gr., George Frederick Ridgeway Marden, O.N. F4718; P.O. Mech.

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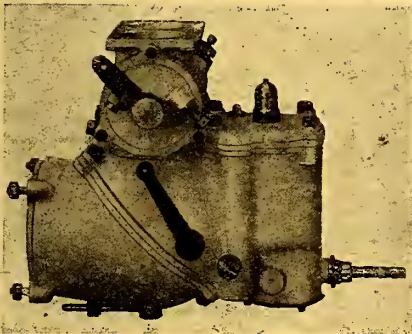
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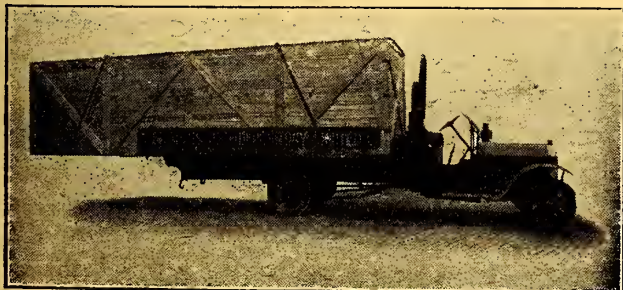
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* * *

The following Officers and Men have been mentioned in dispatches:—

Wing-Comdr. Christopher Lloyd Courtney, R.N.; Fleet Payr. Frederick Richard Waymouth, R.N.; Actg. Wing-Comdr. Alec Ogilvie, R.N.A.S.; Sqdn.-Comdr. Francis Esmé Theodore Hewlett, R.N.; Flt.-Comdr. William Lawrie Welsh, R.N.A.S.; Actg. Flt.-Comdr. Robin Gordon Mack, R.N.A.S.; Actg. Flt.-Comdr. Bryan Charles Clayton, R.N.A.S.; Flt.-Lieut. Grant Armstrong Gooderham, R.N.A.S.; Flt.-Lieut. Charles Dawson Booker, R.N.A.S.; Lieut. Lionel Edwin Innes-Baillie, R.M.A.; Lieut. Oliver George Graham Villiers, R.N.V.R.; Lieut. Ronald George St. John, R.N.V.R.; Flt. Sub-Lieut. Jean de Francia, R.N.A.S.; Flt. Sub-Lieut. Francis Domine Casey, R.N.A.S.

W.O., 2nd Grade, Thomas Martin, R.N.A.S.; Actg. W.O., 2nd Grade, Norman Littlejohn, R.N.A.S.; P.O. Mech. Roland Alfred Siburn, O.N. F2418; P.O. Mech. Walter George Jones, O.N. J.5596; C.P.O. Mech., 3rd Gr., Alfred Ernest Le Sueur, O.N. F3413; Ldg. Mech. Oliver Douglas Robson, O.N. F4735; P.O. Mech. Reginald Arthur Clarke, O.N. F3896; Air Mech., 1st Gr., John McKimmie Young, O.N. F3652; P.O. Mech. Donald Brigham, O.N. F641; P.O. Mech. Philip Hiram Dimmick, O.N. F1207; Air Mech., 1st Gr., Frederick John George, O.N. F1997; P.O. Mech. Sidney John Petts, O.N. F1717; Air Mech., 1st Gr., Alfred Dunn, O.N. F9172; Ldg. Mech. Edgar Harold Restall, O.N. F2468; Air Mech., 1st Gr., Francis George Parker, O.N. F2358; P.O. Mech. William Arthur Hill, O.N. F4596; P.O. Mech. Horace Dawson, O.N. F4755; P.O. Mech. Alfred Herbert Doyle, O.N. F4214; Air Mech., 1st Gr., Frederick Metcalf, O.N. F8944; C.P.O. Mech., 3rd Gr., William Wilson Pope, O.N. F1712; P.O. Mech. William Griffiths, O.N. F8339; Ldg. Mech. John Balfour Nesbitt, O.N. F2390; Air Mech., 1st Gr., Robert John Hepworth, O.N. F2175; Ldg. Mech. Thomas Henry Cross, O.N. F976; Ldg. Mech. Septimus Newbury, O.N. F1209.

* * *

WAR OFFICE, May 14th.

REGULAR FORCES.—STAFF.—The following temp. appt. is made at the War Office:—Staff Lt.—Lt. R. G. Cookson, R.F.C., Spec. Res., from a Balloon Officer, vice Sec. Lt. (temp. Capt.) H. F. Anns, Lond. R., T.F., April 1st.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Sqdn. Comdrs.—From Flt. Comdrs., and to be temp. Majors whilst so empld.:—Temp. Capt. B. H. Turner, Gen. List, Nov. 23rd, 1916, but without pay or allowances prior to Feb. 1st; Sec. Lt. (temp. Capt.) C. A. A. Hiatt, M.C., Norf. R., Dec. 17th, 1916; Capt. J. H. S. Tyssen, M.C., Yeo., T.F., Jan. 22nd; Capt. G. Henderson, Ind. Cav.; Lt. (temp. Capt.) R. F. S. Morton, Spec. Res., Jan. 25th. Sec. Lt. (temp. Capt.) C. H. Dixon, M.C., Yorks L.I., March 26th. Lt. (temp. Capt.) E. O. Grenfell, M.C., R.A., April 11th.

Flt. Comdrs.—From Flying Officers, and to be temp. Capt. whilst so empld.:—Sec. Lt. J. K. Aird, Spec. Res., March 9th. Lt. W. E. Molesworth, R. Muns. Fus., April 26th.

Adjut.—Maj. C. A. Walker-Leigh, R.F.C., T.F., vice Capt. J. D. Strong, Ind. Army, April 21st.

Park Comdr.—Lt. (temp. Capt.) G. E. W. Humphreys, Spec. Res., from an Equipt. Officer, 1st Cl., and to be temp. Maj. whilst so empld., March 8th.

Equipt. Officers, 1st Cl.—Temp. Lt. J. Inwood, Gen. List, from 2nd Cl., and to be temp. Capt. whilst so empld., March 9th. 2nd Cl.—Sec. Lt. L. G. Fenner, Spec. Res., from the 3rd Cl., and to be temp. Lt. whilst so empld., Dec. 14th, 1916.

* * *

WAR OFFICE, May 15th.

The following first instalment of a dispatch has been received from Field-Marshal Sir Douglas Haig, G.C.B., Commander-in-Chief of the British Armies in France:—

GENERAL HEADQUARTERS, April 9th, 1917.

Sir,—I have the honour to submit a list of names of those officers, ladies, non-commissioned officers, and men, serving, or who have served, under my command, whose distinguished and gallant services and devotion to duty I consider deserving of special mention.

I have the honour to be, Sir, your obedient servant,

D. HAIG, Field-Marshal, Commander-in-Chief,

The British Armies in France.

ROYAL NAVAL AIR SERVICE.

Bromet, Lt. (Actg. Sqdn. Comdr.) G. K.; Huskisson, Flt. Comdr. E. L.; Mackenzie, Temp. Flt. Lt. (temp. Flt. Comdr.) C. R., D.S.O.; Goble, Temp. Flt. Lt. S. J., D.S.C.; Bell, Temp. Flt. Lt. B. C.

STAFF.—Ashmore, Temp. Brig.-Gen. E. B., C.M.G., M.V.O., R.A.

[General Ashmore until recently commanded an R.F.C. Brigade, and this mention in dispatches will be welcomed by all who served under him.—Ed.]

Becke, Temp. Brig.-Gen. J. H. W., D.S.O., Notts and Derby R.

FROM THE COURT CIRCULAR.

BUCKINGHAM PALACE, May 12th.

The following Officers had the honour of being received by the King, when His Majesty invested them with the Insignia of Companions of the Orders into which they have been admitted:—

THE DISTINGUISHED SERVICE ORDER.

Wing Commander Edward Briggs, R.N.

Captain Augustus Bird, Royal Flying Corps.

The King then conferred decorations as follows:—

THE MILITARY CROSS.

Captain Harold Balfour, K.R.R. Corps, attached R.F.C.

Captain Albert Neale, Lincolnshire Regt. and R.F.C.

Sec. Lt. Gordon McDiarmid, R.F.C.

NAVAL.

The following appointments have been made in the Royal Naval Air Service:—

MAY 9th.—Flt. Lts. (temp.).—H. G. Brackley, T. F. Le Mesurier, I. N. C. Clarke, W. E. Gardner, A. M. Shook, R. J. O. Compston, C. D. Brooker, H. G. Holden, H. G. Travers, and L. S. Breadner, all reappt. as Actg. Flt. Comdrs., seny. May 7th.

MAY 12th.—Mr. A. E. Holder granted a temp. commission as Lt. (R.N.V.R.) seny. May 11th, and appointed to "President," additional, for R.N.A.S.

ADMIRALTY COMMUNIQUÉS.

MAY 12th.—A very heavy bombardment of an important area at Zeebrugge was successfully carried out on the morning of 12th inst. by a portion of the forces under the orders of the Vice-Admiral Dover.

The Royal Naval Air Service rendered valuable co-operation and over 15 aerial combats took place, in which four enemy machines were destroyed and five others driven down out of control.

Two of our machines failed to return, one of which came down in Dutch territory and has been interned.

MAY 14th.—Our Naval Forces destroyed Zeppelin L22 in the North Sea this morning.

THE CASUALTY LIST.

Reported May 9th.

MISSING.—Murton, Flt. Sub-Lt. Harry S., R.N.

PREVIOUSLY REPORTED DROWNED, NOW REPORTED NOT DROWNED.

Smith, Flt. Sub-Lt. Guy D., R.N.

Meade, Lt. William C. A., R.N.V.R.

PREVIOUSLY REPORTED MISSING, NOW REPORTED A PRISONER.—

Hewitt, Flt. Sub-Lt. Neville D. M., R.N.

Reported May 12th.

KILLED.—Penney, Prob. Flt. Officer D. E., R.N.

DROWNED.—Railton, Flt. Lt. J. C., R.N.

Wigham, Flt. Sub-Lt. R. S., R.N.

WOUNDED.—Wimbush, Flt. Sub-Lt. L. E. B., R.N.

ACCIDENTALLY INJURED.—Steel, Flt. Sub-Lt. L. G., R.N.

Reported May 12th.

WOUNDED.—Broad, Flt. Sub-Lt. H. S., R.N.

Crundall, Flt. Sub-Lt. E. D., R.N.

MISSING.—Moir, Flt. Lt. Charles J., R.N.

ACCIDENTALLY INJURED.—Hall, Flt. Sub-Lt. Arthur E., R.N.

CORRECTION.—KILLED.—Flt. Sub-Lt. D. E. Penney, R.N.—Rank should be as herein stated, and not as previously announced.

Reported May 15th.

ACCIDENTALLY KILLED.—Morgan, Flt. Lt. (Actg. Sub-Lt., R.N.R.) L., R.N.

Seed, Prob. Flt. Officer R. H., R.N.

WOUNDED.—Gagnier, Flt. Sub-Lt. O. J., R.N.

MISSING.—Daniell, Flt. Sub-Lt. John B., R.N.

KILLED.—Coughlan, J. L., Air Mech., 1st Gr., M13049.

Lockyer, A. G., Actg. Mech., 1st Gr., F7129.

Turner, G. V., Air Mech., 1st Gr., J11292 Ch.

DIED OF INJURIES.—Dear, P., Actg. Mech. 1st Gr., F5426.

Woodnough, G. R., Aircrftmn., 2nd Gr., F21095.

PERSONAL NOTICES.

DEATHS.

BOYLAND.—The body of C. D. Boyland, R.N.A.S., has been washed ashore at Killingholme, in the River Humber.

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He had been missing for a month, and is believed to have fallen from a jetty.

MORGAN and SEED.—Flt. Lt. Morgan, R.N., of Taunton, and his observer, Probationary Flight Officer Seed, R.N., of Saltash, were killed whilst flying on May 13th. They were in a biplane, and whilst flying at an altitude of 5,000 or 6,000 ft. there was what was supposed to have been an explosion. The machine nose-dived into the Edmonton District Council's sewage farm, and when help arrived both aviators were found to be dead.

WEIL.—Flt. Sub-Lt. Louis Marcus Basil Weil, R.N.A.S., attached R.F.C., was the eldest son of Mr. and Mrs. B. B. Weil. He was reported missing by the Admiralty on April 7th, and news unofficially received on May 11th states that he died on April 6th, having been shot through the head by enemy fighting machines. He was born in 1899, and was educated at Clifton.

WHIGHAM.—Flt. Sub-Lt. Robert S. Whigham, R.N., who was drowned on active service on May 9th, was the younger son of Mr. and Mrs. William B. Whigham, of San Cristobal, Prov. de Santa Fé, Argentine Republic, and nephew of Mr. and Mrs. G. Macdonald Allan, of 155, Camden Road, London, N.W.1. He was 19 years of age.

ENGAGEMENT.

LEIGH—SIMPSON.—The engagement is announced between Hubert Poyntz-Gaynor Leigh, R.N., R.N.A.S., second son of Mr. and Mrs. E. Leigh, of Cobridge, Staffs., and Dorothy Mary Isabelle, only daughter of Mr. and Mrs. S. J. Simpson, of Bank House, Burslem, Staffs.

MARRIAGE.

WOOLLEY—PETCH.—On May 9th Flight Lieut. Svdney J. Woolley, R.N., of Leeds, was married to Miss Alice Petch at Trinity Wesleyan Church, Roundhay Road, Leeds.

Flight Lieut. Woolley has seen a good deal of active service and has experienced several narrow escapes from serious accident while on duty.

Vice-Admiral King Hall, writing with reference to the presentation of an aeroplane to the South African Government last Saturday, says that the condensation of General Smuts's remarks might lead the casual reader to infer erroneously that the Air Service employed in the operations against the Königsberg was Belgian.

He points out, therefore, that throughout the operations the aerial work was carried out solely by officers of the R.N.A.S., augmented by volunteer officer observer from the squadron under his command, among these volunteer observers being that gallant and valuable officer, the late Commander the Hon. Richard Bridgeman, D.S.O., who recently lost his life when flying in the same locality.

* * *

Captain Lambe, who has been appointed a Companion of the Distinguished Service Order, will be remembered as the officer commanding H.M.S. "Hermes" when that vessel was torpedoed while crossing from Dunkirk at breakfast-time on Oct. 31, 1914. He has since been largely occupied with the R.N.A.S., under the Admiral Commanding Dover Patrol. This award of the D.S.O. will doubtless be recognised as an official refutation of the criticisms which have been levelled in the House of Commons against the absence during prolonged periods of aircraft raids on the German destroyer and submarine base at Zeebrugge.

* * *

Squadron Commander Newton Clare, whose appointment to a Companionship of the Distinguished Service Order is gazetted, is, both in years and service, one of the oldest active service pilots. He distinguished himself by gallantry and hard work in Flanders at the outbreak of war, and later continued his good service in Gallipoli. His subsequent promotion was welcomed by all who served with him, and the honour now conferred will be highly appreciated by officers and men alike.

MILITARY.

G.H.Q. COMMUNIQUE'S.

May 8th, 8.58 p.m.—Bombing operations by our aeroplanes were continued yesterday and during the previous night, and large quantities of explosives were dropped with good results.

During the day seven of our aeroplanes carried out a highly successful attack upon the enemy's observation balloons, seven of which were brought down in flames. Six German aeroplanes were brought down in air fighting, and two others were shot down by fire from the ground. In addition, seven German machines were driven down out of control.

Eight of our aeroplanes are missing.

May 10th, 8.57 p.m.—There was again severe fighting yesterday in the air. Six German machines were brought down by our aeroplanes, and five others were driven down out of control.

Five of our aeroplanes have not returned.

May 11th, 8.20 p.m.—Activity in the air continued yesterday. Three German aeroplanes were brought down in air fighting and three others were driven down out of control.

Two of our machines are missing.

May 12th.—In air fighting yesterday seven German aeroplanes were destroyed and five others were driven out of control. Four of our aeroplanes are missing.

May 13th.—Five German aeroplanes were brought down in air fighting yesterday and five others were driven down out of control. One other hostile machine was shot down in our lines by our anti-aircraft guns. Six of our aeroplanes are missing.

May 14th, 9.33 p.m.—In air fighting yesterday, six German aeroplanes were brought down and two other hostile machines were driven down out of control. Three of our aeroplanes are missing.

WAR OFFICE COMMUNIQUE'S.

The G.O.C. the British Forces in Macedonia, reports:—

May 10th.—Bombing raids by the R.F.C. and the R.N.A.S. on the enemy's tents, sheds, dug-outs, and transport caused much damage, one and half tons of explosives being dropped with good effect.

The G.O.C. the British Forces in Macedonia, reports:—

May 11th.—Our aeroplanes have carried out four successful bombing raids, and have dropped a large quantity of explosives on the enemy's dug-outs, dumps, and transports.

THE CASUALTY LIST.

Reported May 9th.

KILLED.—Bonner, Sec. Lt. A., S. Staffs. R., attd. R.F.C.
Patterson, Lt. H. C., Bedf. R., attd. R.F.C.
MISSING, BELIEVED KILLED.—Radcliffe, Lt. G. A., A. and S. H., attd. R.F.C.
WOUNDED.—Oxspring, Capt. R., M.C., Yorks L.I., attd. R.F.C.
Ross, Sec. Lt. H. G., R.E. and R.F.C.
Stewart, Sec. Lt. S. J., R.F.C.
MISSING.—Davidson, Capt. D. A. L., M.C., R.F.C.
Freemantle, Sec. Lt. R. P. C., R.F.C.
Lawrence, Sec. Lt. N. A., R. Fus., attd. R.F.C.
Reece, Sec. Lt. C., Ches. R., and R.F.C.
Sherman, Sec. Lt. P., R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Hills, Sec. Lt. F. E., R.G.A. and R.F.C.
Hills, Sec. Lt. W. B., Hamp. R. and R.F.C.
Mare-Montebault, Sec. Lt. M. J. J. G., Yeo. and R.F.C.
Purves, Sec. Lt. S. S. B., Yeo. and R.F.C.
KILLED.—R.F.C.—Hodgson, 2316 Cpl. W.
DIED.—R.F.C.—Cole, 33404 2nd Cl. Air Mech. H. Prior, 62928 2nd Cl. Air Mech. W.
WOUNDED.—R.F.C.—Bell, 2125 Sgt. J. V.
Peirson, 65247 2nd Cl. Air Mech. H. M.
INDIAN FORCES.—**MISSING.**—Stedman, Sec. Lt. F., I.A.R.O., attd. R.F.C.
AUSTRALIAN FORCE.—**WOUNDED.**—Rutherford, Capt. D. W., Inf. and R.F.C.
DIED.—**AUSTRALIAN FLYING CORPS.**—Allen, 1313 Pilot T. M.

Reported May 10th.

KILLED.—Morris, Sec. Lt. E. P., Buifs and R.F.C.
Pickering, Lt. C. L., Ches. R. and R.F.C.
Watson, Sec. Lt. A. W., R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Summers, Capt. A. S. M., Hrs., attd. R.F.C.
DIED OF WOUNDS.—Pile, Sec. Lt. C. J., R.F.A. and R.F.C.
PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF WOUNDS.—Andrews, Sec. Lt. F. S., R.F.C.
Morris, Sec. Lt. F. St. V., Sher. For., attd. R.F.C.
WOUNDED.—Knight, Sec. Lt. C. C., Dorset R. and R.F.C.
Nicholls, Sec. Lt. E. C. H., R.W. Surr. R. and R.F.C.
Perry, Sec. Lt. E. O., Sher. For. and R.F.C.
Thompson, Sec. Lt. C. J., R.F.C.
MISSING.—Barwell, Capt. F. L., Lond. R. and R.F.C.
Burns, Sec. Lt. V. L. A., R.F.A. and R.F.C.
Davies, Sec. Lt. J. E., Lond. R. and R.F.C.
Edwards, Sec. Lt. E. L., Welsh R., attd. R.F.C.
Fereman, Sec. Lt. A. E., Middx. R., attd. R.F.C.
Harding, Lt. G. P., M.C., Ches. R., attd. R.F.C.
O'Brien, Lt. C. R., R. Lanc. R. and R.F.C.
Paris, Lt. D. K., R.F.A. and R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Fairbairn, Sec. Lt. J., R.F.C.
CANADIAN CONTINGENT.—**KILLED.**—Hartney, Lt. J. C., Manitoba R., attd. R.F.C.
Pfimmer, Lt. V. R., Can. Divi. Amm. Col., attd. R.F.C.

Reported May 11th.

WOUNDED.—Cleaver, Lt. C. T., M.C., R.F.C.
Elliot, Lt. F. E., R.G.A., attd. R.F.C.
Harrison, Sec. Lt. L. G., R.F.C.
Lucas, Sec. Lt. A. J., R.F.C.
Richards, Sec. Lt. H. L. E., R.W. Fus., attd. R.F.C.
Sellers, Lt. E. L., Manch. R. and R.F.C.
Twamley, Sec. Lt. H. E. R., Sher. For., attd. R.F.C.
MISSING.—Mactavish, Sec. Lt. D., Cam. High. and R.F.C.
Hunt, Sec. Lt. E. W. A., R.F.C.
Stout, Sec. Lt. G. R. Y., A. and S. H. and R.F.C.
Upson, Sec. Lt. R. H., R.W. Surr. R. and R.F.C.

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CANADIAN CONTINGENT.—WOUNDED.—MacIver, Lt. A. A. J., Alberta R., attd. R.F.C.

Reported May 12th.

KILLED.—Davies, Sec. Lt. R. B., Northd. Fus. and R.F.C.
King, Sec. Lt. B., K.O.Y.L.I. and R.F.C.

Morris, Sec. Lt. M. J., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Pome-roy, Sec. Lt. N. R., R.F.C.

Welch, Sec. Lt. E. A., R.F.C.

WOUNDED.—Collier, Lt. J. T., R.F.C.

Dalziel, Sec. Lt. R.G., R.F.C.

Davis, Lt. T. F., E. Surr. R., attd. R.F.C.

Fauvel, Sec. Lt. L. G., R.F.C.

Fitchat, Sec. Lt. H. E. R., R.F.C.

MISSING.—Browning, Capt. S. F., R.F.C.

Fraser, Sec. Lt. A., R.F.C.

French, Lt. G. S., Camb. R. and R.F.C.

Price, Sec. Lt. H. J., R. W. Surr. R., attd. R.F.C.

CANADIAN CONTINGENT.—KILLED.—Bruce, Lt. C. T., Can. F.A., attd. R.F.C.

WOUNDED.—Geddes, Lt. J. R., Gen. List, attd. R.F.C.

Reported May 14th.

KILLED.—Franklin, Lt. B. L., Midd'x R., attd. R.F.C.

Lomer, Lt. H. C., R.F.C.

DIED OF WOUNDS.—Cooper, Sec. Lt. R. B., R.F.C.

PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF WOUNDS.—Clarke, Sec. Lt. R. B., R.F.C.

WOUNDED.—Bruce, Lt. W., L'pool R., attd. R.F.C.

Coombs, Sec. Lt. H. M., R.F.A. and R.F.C.

Ewbank, Sec. Lt. C. H. P., R.F.C.

Laughton, Sec. Lt. P. S., N. Staff. R., attd. R.F.C.

Moller, Capt. F. S., M.C., R.F.C.

Poland, Lt. T. G., E. Surr. R. and R.F.C.

Ramsey, Sec. Lt. C. S., R.E. and R.F.C.

Redfern, Lt. R. A., R.F.C.

Thomas, Lt. E. A., R.F.A. and R.F.C.

MISSING.—Adams, Sec. Lt. V. H., R.F.C.

Bacon, Sec. Lt. L. G., R.F.C.

Cheatle, Sec. Lt. C. C., R.F.C.

Pinson, Sec. Lt. I. L., S. Staff. R., attd. R.F.C.

CANADIAN CONTINGENT.—MISSING.—Hunter, Lt. G. D., Cent. Ont. R., attd. R.F.C.

Reported May 15th.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Allen, Sec. Lt. R. G. R., W. Yorks R. and R.F.C.

Mitchell, Sec. Lt. J. P. C., High. L.I., attd. R.F.C.

DIED OF WOUNDS.—Trollope, Sec. Lt. W. K., R.F.C.

WOUNDED.—Abram, Sec. Lt. R. K., A. and S.H. and R.F.C.

Bell, Lt. D. H., M.C., Cam'n High., attd. R.F.C.

Leake, Lt. E. G., Manch. R. and R.F.C.

Sanderson, Sec. Lt. A. C., R.F.C.

Stuart, Lt. E. H., Cyc. Bn. and R.F.C.

Turner, Sec. Lt. J. F., Ches. R. and R.F.C.

Wallis, Sec. Lt. F. S., R.F.C.

MISSING.—Coupland, Lt. J. C. G., R.F.A., attd. R.F.C.

PERSONAL NOTICES.

DEATHS.

BATE.—Sec. Lt. Beaumont Bate, attd. R.F.C., who was killed in action on April 29th, was the eldest son of Mr. and Mrs. G. Bate, Rhyddyn Hall, Caergwile, near Wrexham. He was 21 years of age.

BOWYER-BOWER.—Capt. Eldred Wolferstan Bowyer-Bower, East Surrey Regt. and R.F.C. (previously reported missing, now reported killed in action on March 19th), was 22 years of age and son of Capt. and Mrs. T. Bowyer-Bower, of Bramham Gardens and Ashanti, and grandson of the late Major-Gen. Henry Bower.

Capt. Bowyer-Bower was gazetted to the East Surrey Regt. on Aug. 15th, 1914, and went to France in April, 1915, where he fought in the trenches until April, 1916, when he was attached to the Royal Flying Corps out there and where he remained, flying over the German lines as an observer, until Aug. 1916, when he came home to get his pilot's certificate. Capt. Bower flew over to France on Feb. 27th last, and was reported missing on March 19th over Hindenburg's line during the Hun retreat.

COLES.—Lieut. R. H. Coles, Yeomanry and R.F.C., killed on May 9th, was the youngest son of Cales Pacha, C.M.G., and Mrs. Coles, of Stone House, Bishops Hull, Taunton. He was educated at Cheam, Wellington, and the Agricultural College, Cirencester, where he obtained a diploma. He served with the Yeomanry in Gallipoli and Egypt, and obtained his wings last July. He was Master of the Cirencester Beagles, a fearless rider across country, and a good athlete, winning many long-distance races while at Cirencester College.

His Squadron Commander writes:—"He was one of the best, if not the best officer in the squadron, and I had already twice recommended him for promotion to Flight-Commander, and only a few days ago I had forwarded his name for special mention to his Wing Commander."

DAVIDSON.—Capt. Donald Alastair Leslie Davidson, M.C.,

R.F.C., aged 25, who was killed in action on April 30th, was the elder son of the late Col. Leslie Davidson, C.B., R.A., who was also killed in France earlier in the campaign, and of Lady Theodora Davidson, Sister at Paddington V.A.D. Hospital, 37, Porchester Terrace, W.

EVERINGHAM.—Sec. Lt. Guy Everingham, R.F.C., the eldest son of Mrs. Everingham-Wormald, late of Vaenor Park, Llanidloes, now of Colwyn Bay, previously reported missing, was killed on April 8th. He enlisted in Oct., 1914, in the Royal Welsh Fusiliers, obtaining his commission in Feb., 1915. He served with his battalion as signalling officer and in France as bombing officer in the trench mortar battery until he entered the Royal Flying Corps last Sept. He soon obtained his observer's wing. During his leave last Feb., he was married to Gladys, second daughter of Mr. Frank Brown, of Lynwood, Llandudno, returning to the front two days later.

His commanding officer writes:—"We miss him dreadfully and find that he has left a gap which I can never hope to fill. He was always so full of life and keen on his work. In addition to his work as observer he was of great assistance to me in the office and elsewhere . . ."

HEADLEY.—Sec. Lt. Herbert Marshall Headley, R.F.A., attached R.F.C. (reported missing on March 11th, now unofficially reported killed on that date), was only son of Mr. and Mrs. E. M. Headley, of Uplands, Redhill. He was 19 years of age, and had his commission in the Royal Artillery in May, 1915.

HOOD.—Sec. Lt. Douglas Edward Hood, Bedford Regt., was the elder son of Mr. and Mrs. Thomas M. Hood, of Rio de Janeiro. Born at Pernambuco in 1896, he was educated at Forest School, Walthamstow, and Felsted School, Essex, and at the outbreak of war was an apprentice at Messrs. Vickers' Works, Erith. He enlisted in the London Scottish, later received his commission in the Bedford Regt., and shortly after became attached to the R.F.C.

Last Feb. he returned to the Bedford Regt., and went to the front on the 14th of that month. He was killed on April 14th.

A brother officer writes:—"It is a sad blow to us to lose Hood, as he was very popular indeed, and loved by both officers and men alike. He took a great interest in everything, and worked hard both in and out of the lines, and in helping at concerts to amuse the men." His second in command also writes:—"Your son was a splendid officer, and his loss is mourned by all ranks of the battalion."

KING.—Sec. Lt. Berry King, King's Own York. L.I. and R.F.C., who was killed in action on May 3rd, was the eldest son of Mr. and Mrs. A. O'R. King, of Kingston, Jamaica. He was 26 years of age.

LEIGHTON.—Major J. B. T. Leighton, M.C., Scots Guards and R.F.C., who died of injuries received while flying in France on May 7th, was the elder son of Lieut.-Col. Sir Bryan Leighton, Bart., and Lady Leighton, of Loton Hall, Shropshire, Lady Leighton being a Fletcher of Saltoun. Major Leighton was born in 1891, and in his short life he put up a record of which any man might be proud.

He was gazetted to the Scots Guards in 1912, and went with his battalion to Egypt. On the outbreak of war he was seconded to the R.F.C., and quickly became an exceptionally able pilot. He flew to France for the first time in November, 1914, and remained there nine months, flying consistently well throughout the winter.

Later he was sent to Egypt, where he took part in operations against the Senussi. He won the Military Cross for "his fine and gallant work; particularly on one occasion when he descended to a height of 200 ft. and took photographs of the position while his observer engaged the enemy with a rifle." He returned to England early in 1916 as a Squadron-Commander, and took over a training squadron in Hampshire, showing the same outstanding ability in teaching new pilots as he had shown as an active-service pilot himself.

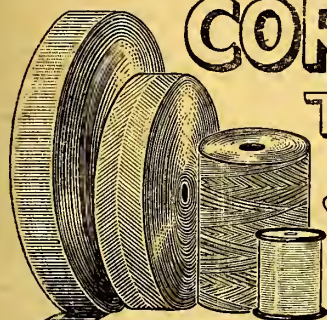
In February of this year he took a new squadron to France, mounted on fighting machines, and his squadron was responsible for many of the gallant efforts mentioned in communiqués and in authorised reports.

His Brigadier wrote of him as "one of the best and most stout-hearted Squadron-Commanders in the Brigade. He loved his squadron, and his squadron worshipped him."

Major Leighton's death was due to one of those almost unavoidable accidents which have cost us so many fine pilots. He was giving a demonstration of methods of war-flying to an officer of high rank, when, in descending, his controls refused to operate, and the machine, which was one of the latest fighting type, spun into the ground. Major Leighton only lived long enough to say that his controls had jammed, and to send a message to his mother.

A keen sportsman, an excellent shot, and a skilful fisherman, young Major Leighton was a splendid specimen of the British officer of the very best type. None has ever heard a word said against him. He was beloved by his men, admired by his junior officers, and respected by his seniors as one on whom they could

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depend, despite his youth, for sound judgment equally with gallantry, skill and daring. One who knew him well writes:—"Though it is infinitely to be regretted that another life of such brilliant promise has been cut short in the height of its career, yet to Major Leighton it was given to do the deeds that make the name of Empire fair,—

'Nothing is here for tears, nothing to wail,
'Or knock the breast, no weakness, no contempt,
'Dispraise or blame, nothing but well and fair,
'And what may quiet us on a death so noble.'"

To the young officer's father and mother one offers deep sympathy in their loss, and the hope that their sorrow may be mitigated by the memory of the gallant acts done by their son in his King's Service.—C. G. G.

LOMER.—Capt. Horace Clifford Lomer, R.N.D., attached R.F.C., who was killed in action on May 5th, was the only son of Horace Arthur Lomer, of Invermark, Elnbourne Road, S.W.17. He was 27 years old.

MACKINTOSH.—Lt. Charles Mackintosh, R.F.C., of Gryon-sur-Bex, was killed in action on April 5th.

MERCHANT.—Sec. Lt. A. D. Merchant, R.F.C., son of Mrs. E. Merchant, of Putney, met with fatal injuries while flying in an aeroplane in Yorkshire on May 13th. The machine fell, and he was picked up in an unconscious condition and conveyed to a military hospital, dying on the way. His age was 18.

ORME.—Lt. Peter William Merton Orme, R.F.C., died in the 2nd General Eastern Military Hospital at Brighton on May 7th, as the result of an accident while riding a motor-cycle near Horsham earlier in the day. The deceased, who was a most promising officer, and had latterly been stationed at Farnborough, was the son of the late Henry Merton Orme and of Mrs. E. H. Orme, of Lutwiche, Bath Road, Worthing, and nephew of the Rev. J. B. Orme, for nearly half a century Rector of Angmering. He was 25 years of age.

O'SULLIVAN.—Sec. Lt. Fergus O'Sullivan, N. Staffs, attd. R.F.C., who was killed in an aerial fight abroad, was the youngest son of Mr. and Mrs. James O'Sullivan, High Bank, Burton-on-Trent, aged 20 years.

YOUNG.—Sec. Lt. A. C. Young, R.F.C., died of wounds, was 19 years of age, and was the only son of Mr. and Mrs. A. Young, 5, Purcell Mansions, Queen's Club Gardens, W. He obtained a commission in the R.F.C. in Aug., 1916.

ENGAGEMENTS.

ANTHONY—LLOYD.—The engagement is announced of Capt. Wynnard Anthony, late R.F.C., only child of Mr. and Mrs. A. Anthony, of Capel House, Colchester, and Rosamund Angharad Kathleen (Kitty), fourth daughter of Mr. and Mrs. Llewelyn Lloyd, of The Yew Trees, Kirby-le-Soken, Essex.

WAINWRIGHT—FOSTER.—The marriage arranged between Charles Brian Wainwright, R.F.A., attached R.F.C., eldest son of Mr. C. H. Wainwright, J.P., and Mrs. Wainwright, of Hill House, Edgware, and Violet Myfanwy, elder daughter of Capt. W. J. Foster, R.A.M.C. (T.), and Mrs. Foster, of Downs, Reading, will take place on Saturday, June 2nd, at St. Mary's Church, Reading, at 11.30 o'clock. All friends will be welcome at the church.

MARRIAGES.

GREENSHIELDS—EMBLOW.—On the 14th inst., at Hendon Parish Church, Sec. Lieut. J. William Greenshields, Essex Regt., attached R.F.C., son of the late Mr. W. Greenshields and Mrs. Greenshields, Eastfield Road, Walthamstow, was married to Doris Emblow, daughter of Mr. C. L. Emblow and the late Mrs. C. L. Emblow, of Derby House, Hendon, by Rev. W. R. K. Robinson, of Wallington, assisted by the Rev. G. H. Chettoe, Vicar of Hendon.

GRIFFITH—WESLEY-SMITH.—On May 1st, at St. Peter's Church, Harrogate, Lt. E. N. Griffith, Oxford and Bucks L.I., attd. R.F.C., son of Col. and Mrs. Griffith, Deanwood House, Cheltenham, and was married to Margery Joan Wesley-Smith, second daughter of Dr. J. Wesley-Smith, of Beech Grove, Harrogate, and Folkestone, by the Rev. R. C. Griffith, brother of the bridegroom.

HAY—HADFIELD.—On the 12th inst., at Holy Trinity Church, Cookham, Lieut. Jack Valentine Hay, R.F.C., son of the late Robert Hay, of Riverdale, Inverness, was married to Sydney Agnes Hadfield, youngest daughter of H. C. Hadfield, of Huntley, Maidenhead, Berks, by the Rev. Dr. Batchelor.

RAWCLIFFE—HILTON.—On May 5th, at St. Andrew's Church, West Kensington, Donovan Maclean Rawcliffe, R.F.C., only son of the late A. Walter Rawcliffe and Mrs. Rawcliffe, of Culraven, Haigh, Lancashire, was married to Dorice, elder daughter of Harold H. Hilton, of 24, Sunderland Avenue, London, W., by the Rev. W. G. de L. Wilson.

STRADLING—COUNSELL.—On May 8th, at the Parish Church, Yatton, Somerset, Arthur George Stradling, Lieut., R.F.C., was married by special licence to Grace Helen, eldest

daughter of the late Walter Counsell and Mrs. Counsell, Somerset House, Yatton, by the Rev. Fiddian E. Peart.

BIRTHS.

HUNT.—On May 8th, at Blackheath, the wife of Lt. W. V. Hunt, attached R.F.C., of a son.

O'FARRELL.—On May 7th, at 38, First Avenue, Hove, the wife of Major E. H. M. O'Farrell, Royal Irish Fusiliers and R.F.C., of a son.

After a trial lasting six days, a general court-martial at Peterborough on Saturday returned a verdict of "Not Guilty" in the case of five flying officers charged with conduct prejudicial to good behaviour and military discipline, at the Grand Theatre, Peterborough. The officers were immediately released.

FRANCE.

OFFICIAL COMMUNIQUÉS.

MAY 8th.—In the period from May 1st to 7th our pilots have engaged the enemy aviators in numerous combats.

During these air fights 25 German aeroplanes have been brought down, and their destruction has been most strictly verified.

In addition, 51 German machines, seriously damaged, have fallen in their lines. The destruction of most of them is probable, but could not be verified.

Our pilots during this period have increased the number of their exploits. Capt. Guynemer gained his 37th and 38th victories. Sous Lt. Nungesser brought down three aeroplanes. This brings to 24 the number of adversaries over whom he has triumphed up to date. Sous Lt. Dorme brought down his 22nd machine, Capt. Heurteaux his 21st, Lt. Pinsart his 11th and 12th, and Adjt. Madon his 10th machine.

MAY 8th.—ARMY OF THE ORIENT.—British aircraft successfully bombarded enemy depots at Dedeli and Paljortza.

MAY 10th.—According to fresh reports, five German machines announced to have been seriously damaged on April 24th, May 2nd, 4th, 5th, and 7th, were actually brought down.

Our pilots brought down yesterday two German aeroplanes, which fell in flames.

MAY 11th.—Yesterday our pilots brought down five enemy aeroplanes in aerial fights. Four other German machines were forced to land seriously damaged.

MAY 12th.—On May 11th our chasing aeroplanes had numerous fights in which seven German aeroplanes brought down by our pilots were completely destroyed. Seven others received severe damage and fell out of control into their lines.

MAY 14th.—Yesterday and on Saturday six enemy aeroplanes were brought down.

Our bombing squadrons dropped 4,000 kilogrammes (four tons) of explosives on railway stations and bivouacs behind the German front.

GERMANY.

OFFICIAL COMMUNIQUÉS.

MAY 8th.—In the month of April the enemy lost 362 aeroplanes and 29 captive balloons. Of the former 299 were brought down in aerial battles. We lost 74 aeroplanes and 10 captive balloons.

The past month has shown the German aerial-fighting forces at the zenith of their capacity. Whilst our defensive means were successfully occupied in warding off ruthless enemy bomb-attacks on the Fatherland, the heavy fighting in April made the highest demands on aviators, captive balloons, and anti-aircraft guns in the field. In co-operation, which daily grew more intimate, they showed themselves equal to their tasks.

Our bombing squadrons destroyed important military establishments, and our aerial reconnoitring operations brought valuable information to headquarters.

The self-sacrificing co-operation of our aviators on the battlefield has supported in an exemplary manner the heavy infantry and artillery fighting.

On May 7th the enemy lost 20 aeroplanes. Lt. Bernert shot down his 27th opponent and Lt. Baron von Richthofen his 20th.

MAY 10th.—Nine enemy aeroplanes were brought down in aerial battles, and one by the fire of our anti-aircraft guns.

MAY 11th.—In aerial battles and by our anti-aircraft guns 18 enemy aeroplanes and one captive balloon were brought down on May 10th.

Lt. Baron von Richthofen conquered his 22nd and Lt. Gontermann (or Gonnermann) his 20th opponent.

MAY 12th.—Fifteen enemy aeroplanes were brought down yesterday.

On May 10th several air attacks were made on Zeebrugge and Bruges. In all 60 bombs were counted to have been dropped. No military damage was done anywhere. Two enemy aeroplanes were shot down by our anti-aircraft guns.

MAY 13th.—On May 12th the enemy lost 14 aeroplanes in aerial encounters and three aeroplanes which were shot down to the earth by our anti-aircraft fire. A French aviator was compelled to make a forced descent behind our lines.

MAY 14th.—The enemy yesterday lost 12 aeroplanes and one captive balloon. Lt. Wolff shot down his 30th and Lt. Baron von Richthofen his 24th adversary.

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RUSSIA.

OFFICIAL COMMUNIQUÉ.

MAY 10th.—AVIATION.—Sub-Lt. Navrotsky brought down a German aeroplane, which fell in the region of Kozofi, to the east of Brzezany. The machine was undamaged, and its occupants were made prisoners.

AUSTRIA.

At the invitation of the Austrian Aero Club a conference was held at Vienna on May 9th in connection with the creation of a uniform Air Service and uniform air traffic law for the Central Powers.

ITALY.

OFFICIAL COMMUNIQUÉS.

MAY 9th.—On May 4th five Austrian seaplanes bombarded the neighbourhood of Castellammare, on the Adriatic. No damage was done.

Last night hostile aircraft dropped bombs on some places on the Lower Isonzo and in the neighbourhood of Cormons. At Romans one of our camp hospitals was hit and eight casualties were caused among the patients.

MAY 11th.—On the night of the 10th hostile aircraft dropped bombs in the Gorizia area without doing any damage. Our seaplanes bombed the aviation base of Prosecco, north of Trieste. Yesterday one of our squadrons bombed the railway works of Rifemberga (Rifenberg, Gorizia-Trieste railway) with good results and returned safely. One enemy machine was brought down in an air fight.

MAY 12th.—Enemy aircraft on the night of the 11th bombed Punta Sdobba and some other places on the Lower Isonzo, causing one casualty. One of our squadrons bombed the railway works at St. Daniele, in the Branizza Valley (Frigido [Vippacco]). One of our Caproni machines reached Pola and caused a fire to break out in the arsenal. An enemy machine succeeded in reaching Brescia (about 20 miles from the Italo-Austrian frontier), but did not drop bombs.

MAY 13th.—Hostile aircraft dropped bombs on Isola Morosini and other localities on the Lower Isonzo, killing a civilian. Our seaplanes renewed the bombardment of the aviation base of Prosecco, north of Trieste. During an air fight above Gorizia one enemy machine was brought down.

MAY 14th.—Enemy aeroplanes made repeated attempts to reconnoitre in the Sugana Valley, but were hindered by our air patrols.

Aerial activity also increased. A hostile squadron dropped bombs in the Aquileia area (delta of the Isonzo), damaging the basilica and archaeological museum. In a brilliant engagement on the Middle Isonzo two enemy machines were brought down by our aviators.

* * *

SEMI OFFICIAL, MAY 12th.—Last night enemy aircraft having appeared over our coast territory our hydro aeroplanes, together with Army aeroplanes, went up for the purpose of making an immediate raid on enemy territory. The Lloyd arsenal and the works at Santa Saba, near Trieste, were bombed, extensive fires demonstrating the efficiency of the bombardment. Despite lively anti-aircraft fire by the enemy our machines returned undamaged to their base.

SEMI OFFICIAL, MAY 13th.—Considerable hydro aeroplane activity is reported in the Upper Adriatic. Enemy machines yesterday dropped bombs in the neighbourhood of the mouth of the River Po, without, however, doing any damage. They were effectively counter-attacked by our anti-aircraft guns.

On the other hand our hydro aeroplanes, in the course of a reconnaissance along the enemy coast line, successfully attacked in the vicinity of Cape Salvore (Peninsula of Istria) an enemy convoy which was fairly close inshore. We sustained no losses. Our naval batteries effectively participated in the artillery activity, which has broken out afresh on the coastal portion of the Isonzo front.

TURKEY.

OFFICIAL COMMUNIQUÉ.

MAY 8th.—SINAI FRONT.—Five of our aeroplanes attacked an enemy aerodrome and dropped some hundreds of kilograms of bombs on it. A fire was observed to break out in the aerodrome as the result of several hits. In spite of the violent fire of anti-aircraft guns, our machines returned safely.

Enemy aeroplanes attacked an open town and dropped bombs on the inhabitants, against whom they also opened machine-gun fire, unfortunately killing some women and children and wounding others.

On the Irak front an enemy aeroplane was brought down behind our lines. The captured machine will be utilised by us.

SERBIA.

OFFICIAL COMMUNIQUÉS.

MAY 9th.—Our aviators successfully bombarded the enemy's depots at Kruevo.

MAY 10th.—Our aviators successfully bombarded the enemy encampments along the front.

MAY 13th.—Our aviators bombarded the enemy camps near Konopista and Mržence.

BELGIUM.

OFFICIAL COMMUNIQUÉ.

MAY 4th.—The fine weather has favoured the activity of Belgian aviation which has executed numerous reconnaissances and chasing flights. One of our aviators, as the result of a fight over Lecke, has brought down a German two-seater in the enemy's lines. The Belgians have bombarded by night the stations of Larren and Vyfwerge, the hutments of Praebösch and the aerodrome of Ghisteltes, dropping 1,560 kilos of bombs.

LORD DERBY ON AERONAUTICAL HISTORY.

The Earl of Derby, Secretary for War, opened on May 12th, at the Walker Art Gallery, Liverpool, the official Air Services Exhibition organised by the Countess of Drogheda for the benefit of the Flying Services Fund administered by the Royal Aero Club, and for the Red Cross.

He said it was impossible to speak too highly of the bravery of the members of the Flying Corps. He defied anybody to say whether any nation had got complete supremacy of the air, but he would like to compare this supremacy of the air which we had at present with the supremacy of the sea which we claimed. (Hear, hear.) We said we had the supremacy of the sea, and a great many of our ships remained in harbour. The Germans said they had the supremacy of the sea, and all their ships remained in harbour. (Laughter and cheers.) Let both say they have got the supremacy of the sea, but he ventured to say that the supremacy of the sea which England had got was the one we preferred to have rather than the one the Germans pretended to have. (Hear, hear.) So it was with our Air Services. On the essential days in the battles of Arras and the Somme in July the supremacy of the air was ours absolutely. [At a price.—Ed.]

As regards the supremacy and the bravery of the men in the air there could be no comparison between our nation and any others. "The only thing," added Lord Derby, "we have got to think of is the supremacy of invention and, what is just as important, of supply. Is that as much in our hands as we would wish it to be? No; because you never get all you want, either the Flying Corps or anything else, in this world." [Especially under some forms of official control.—Ed.]

"But I do believe that at the present moment there are better brains at work in this country in perfecting and improving our flying machines than there are in any other country in the world. (Hear, hear.) This department of flying is no longer entirely confined to the War Office; it is now under an Air Board, and there are many people who say they are not doing all they ought to do. As a general rule the people who tell us that nothing is being done are just the people who are the most ignorant of what is being done. As a matter of fact, at present there is no stone being left unturned to do all that is possible to be done by human intelligence to improve the flying capacity of our Air Services." [There are still a few stones round the necks of the really efficient people under the Air Board, and those stones remain unturned-out. Till they are turned-out the Flying Services cannot come to their highest efficiency.—Ed.]

"When I turn to the question of supply I hope you will not take it out of place on my part if I draw the attention of those who are responsible for work in the manufacture of those machines to the grave danger to our Air Services and men which results from any stoppage of work at such a moment as this. The loss of a day in a workshop may mean the loss of a hundred lives on the battlefield, and I do ask those who are engaged in the manufacture of these instruments of war to consider the position most carefully and be certain that they do all they can to help the Flying Corps in their arduous and dangerous work." (Hear, hear.)

Proceeding, Lord Derby said that the Flying Corps had received seven V.C.'s, 72 D.S.O.'s, 304 Military Crosses, 97 Military Medals, 54 D.C.M.'s, and 53 Meritorious Service Medals, besides innumerable honours from foreign Allied nations and 486 mentions in dispatches.

A STRIKE BREAKER.

It is reported that during the strike of engineering shirkers last week in one strike district, these so-called "men" were holding an open-air meeting as an aviator was circling overhead. He promptly nose-dived straight at the crowd.

As he descended the meeting broke up ignominiously, the crowd running for their worthless lives every time he appeared. Each time the meeting was resumed the pilot repeated his performance, until the strikers abandoned the gathering in disgust.

It was believed that all the strikers in this district would return to work next day, but one cannot help regretting that the aviator was not a German well provided with bombs.

THE DESTRUCTION OF L22.

Messages from Holland state that the Zeppelin brought down by a Naval monitor, as described in the special Admiralty communiqué, fell near the Terschelling Bank.

Eyewitnesses on the Dutch coast state that the airship had three gondolas, but they would naturally not see the fourth, had it been a standard Zeppelin—which seems likely.



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THE DEATH OF MR. ROWLAND DING.

Mr. W. Rowland Ding, who has long been known in connection with British aviation, was killed while testing a biplane in Yorkshire on May 12th. It is reported that he was looping the loop at some 3,000 ft., when the wings came adrift.

Mr. Ding will be remembered by the earlier fervents of aviation as a constructor of models in conjunction with Mr. W. H. Sayers, the Ding-Sayers models being notable for their inherent stability when flying, and their strong construction. Later on the partners endeavoured to build a full-size machine at Brooklands, but funds to complete it were not available. Mr. Sayers continued to work at aeroplane construction with various firms, and to study the scientific side of aviation with marked success.

Mr. Ding later learned to fly and became an expert pilot. Before the war, he flew the first Handley Page biplane. Soon afterwards he formed the Northern Aircraft Co., Ltd., on Windermere and opened a water-plane school. This firm went into liquidation last year, and Mr. Ding took up testing various makes.

It is not made known officially on what machine he met his death, but it is said that he was flying a B.E. fitted according to the desires of Government experts with an engine of considerably higher power than it was originally designed to carry.

OFFICIAL IMAGINATIONS.

The series of apparently official articles dealing with the R.N.A.S., the first of which was published on May 15th, makes a bad mistake at the very start. It begins "The Royal Naval Air Service found itself 'over the other side' about the time that the shells of British monitors began feeling for the hidden batteries of the Boche behind the Belgian coast."

As a matter of fact, the R.N.A.S. found itself over the other side almost before any other British force. The writer of these articles has apparently forgotten, if he ever knew of, the gallant little force under Major Gerrard, R.M.L.I., which invaded Germany before Antwerp fell, and bombed Düsseldorf and Cologne. Also he omits the work done by the detachment under Commander Samson which worried the advancing Germans long before there were any batteries on the Belgian coast.

Considering that a number of D.S.O.'s and special promotions were won during this period, the omission does not give one confidence in the official narrator, nor is the confidence increased by the narrator's suggestion that the R.N.A.S. was requested by the "Navy-that-Floats" to go and spot for them. Those who actually did the aerial spotting in the early days, before the Navy awoke to the existence, let alone the value, of aeroplane spotting, will smile somewhat grimly at the pleasing image conjured up by the opening of the tale.

CONGRATULATIONS.

"GORDON ENGLAND.—On May 10th at Walton Cottage, Peterborough, the wife of E. C. Gordon England—a daughter."

Mr. Eric Gordon England will be remembered as one of the first men to fly in this country, and he has long been a successful designer and constructor of aeroplanes. He has done excellent work as manager of the Aviation Department of Frederick Sage and Co., Ltd., of Peterborough.

CONSTRUCTIONAL MATERIALS, METHODS AND USES OF MODERN AIRSHIPS, KITE BALLOONS, AND FREE BALLOONS.

Colonel Waterlow gave his deferred lecture on the above subjects at Cricklewood on Thursday evening last, Mr. Griffith Brewer occupying the chair.

Starting with the uses of lighter-than-air craft, Colonel Waterlow dealt first of all with free balloons. These, he said, had no commercial value as far as he knew, and as regards the present war they were merely used for training purposes.

Captive kite balloons, on the other hand, were used in every army for observation purposes, and when so used were usually protected from hostile aeroplanes either by anti-aircraft guns or aeroplanes. Aeroplanes, Col. Waterlow said, usually attack captive balloons by firing some form of projectile which sets the hydrogen in the balloon on fire, and, in view of such a contingency, the occupants are provided with a parachute by means of which they can escape safely to the ground.

There are, the lecturer stated, other uses for kite balloons, but as to them he could say nothing, and in any case observation of fire represented their principal value.

USES OF AIRSHIPS.

As regards airships, they might be used either with the Army or the Navy. On land the airship must be used by night alone. It was, Col. Waterlow said, too vulnerable to aeroplane attack if employed by day.

In spite of the apparent lack of success of German airship raids on this country, it was impossible to say that they served no military purpose. When one considered the immensity of the defensive arrangements that had become necessary to cope with the menace, and the number of anti-aircraft guns, aeroplanes, searchlights, and men whom we had to retain in England on the off-chance of Zeppelin raids, one could arrive at some idea of the military value of the airship.

Now as regards the naval value of airships, their main value

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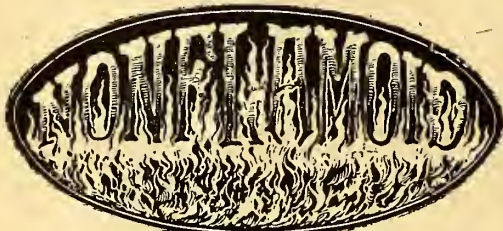
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was twofold: (1) for reconnaissance; (2) for observation of gunfire.

Reconnaissance, Col. Waterlow said, could be divided into two categories: work with the fleet and coastal reconnaissance. For work with the fleet it was necessary for a craft to be able (1) to regulate its speed to that of the fleet with which it is co-operating; (2) to have an endurance in the air of at least 30 hours; and (3) to communicate by wireless, and also, when necessary, by lamp or flag signalling.

Col. Waterlow explained how the size of gun which could usefully be mounted in a ship was limited by the difficulty of seeing the target at maximum range.

This difficulty was at once overcome by the use of aerial observation, by means of which not only could the fall of the shot be seen with infinitely greater accuracy, but it became possible to use guns of larger calibre and longer range.

Airships could also be employed for coastal and local reconnaissance, and for this purpose need not be capable of so great an endurance, and consequently might be of a very much smaller size. With regard to the work done in this direction, Col. Waterlow said he had nothing to add to the official announcement which had already been made that a British airship had successfully bombed a German submarine.

FABRIC.

Col. Waterlow then turned his attention to the question of construction, dealing first with fabric. The requirements of fabric for airship purposes were very severe. It must be light, strong, gas-tight, must not absorb water, or be liable to damage by exposure to sun, rain, or climate; must be readily repaired, durable, and not tear easily. In dealing with the question of gas-tightness, Col. Waterlow explained that it was not so much a question of gas escaping out of the envelope as air getting in, and this was one of the most serious difficulties to be contended with in the manufacture of airship fabric.

Col. Waterlow told his audience how in 1911 the "Delta" was to be used in the Autumn Manœuvres, but it was found that so much air had got into the envelope and mixed with the hydrogen, that it would not even lift its own crew, and they were afraid that unless something could be done quickly to remedy matters and enable the airship to take part in the manœuvres, the "powers that be" would declare that airships were of no use and would not allow any more money for their manufacture.

Luckily, however, someone came to the rescue with a kind of dope which is now largely used for the purpose of "proofing" fabric. This dope Col. Waterlow described as being something like the preparation called "Newskin," which one put on a cut and which "hurt like blazes" and formed a kind of skin over the place where applied.

He then went into the various fabrics which had been used and suggested for airships. Of these, he said, the one most commonly employed was rubbered cotton, which was made up of two or three layers of cotton each rubbered on one side. This material was very difficult to tear, an important factor when one considered that in the event of an extensive tear pilot and passengers would very soon come to a "sticky finish."

Aluminium sheet had been tried, but was found to be too heavy and too difficult of manufacture to be practicable.

RIGGING.

As regards rigging, stranded steel cable was generally used when outside the envelope, and hemp when inside. It was, he said, very undesirable to use steel cable inside the envelope, as if any moisture got in, the steel cable would quickly rust, and this coming into contact with fabric would soon cause the latter to be "done in."

He then dealt with the question of valves, air supply to ballonets, planes, rudders and car.

With regard to control systems, these varied a great deal, and in small airships a one-man control was necessary, and in this event what you wanted was a man with at least three pairs of hands, and it called for considerable ingenuity to arrange everything conveniently.

The lecture was well illustrated, and was brought to a close by some exceedingly interesting slides of the remains of the Zeppelins brought down in this country.

Quite an animated discussion followed this most absorbing lecture.

A VALEDICTORY ADDRESS.

The Chairman drew attention to the fact that this was the last of the present series of lectures at Cricklewood under the auspices of the Aeronautical Society, and in addition to the vote of thanks to the lecturer he wished also to propose votes of thanks in favour of Mr. Bertram Cooper, A.F.Ae.S., and Mr. Handford for their work in connection with this series of lectures.

Mr. Cooper "retaliated" by proposing a vote of thanks to the Chairman, and also to Mr. Handley Page, who had so generously undertaken the financial arrangements in connection with these lectures. Mr. Cooper said he hoped that by the autumn of this year the proposed local students' branch of the Aeronautical Society would be in full swing in the Cricklewood and Hendon district, and be able to carry out their own series of lectures.

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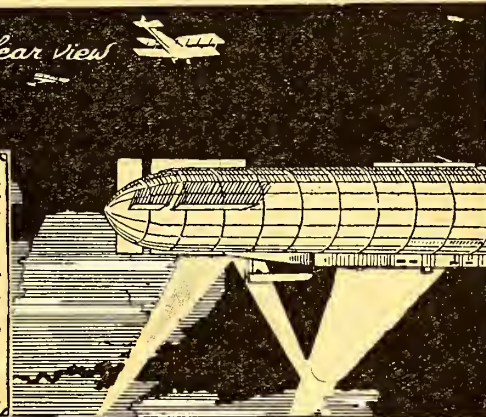
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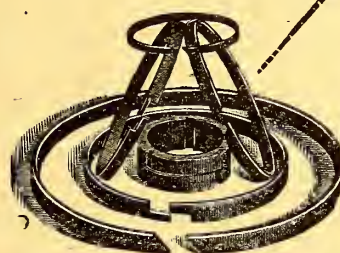
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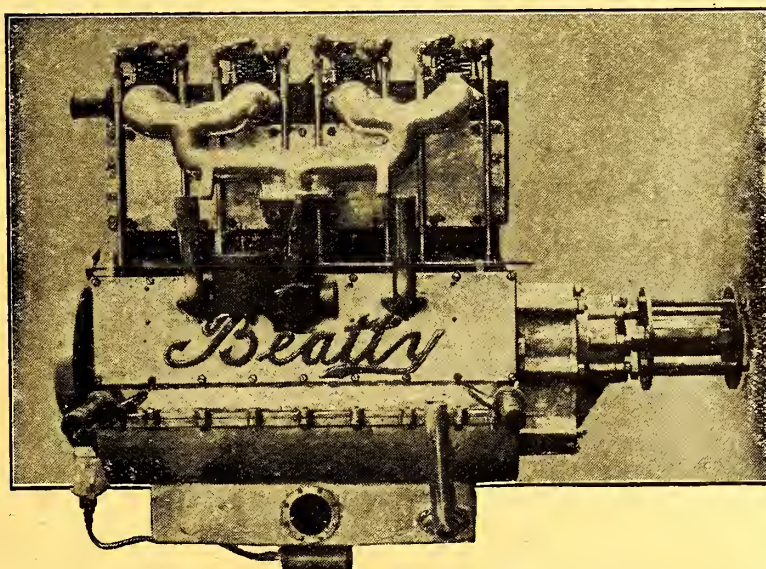
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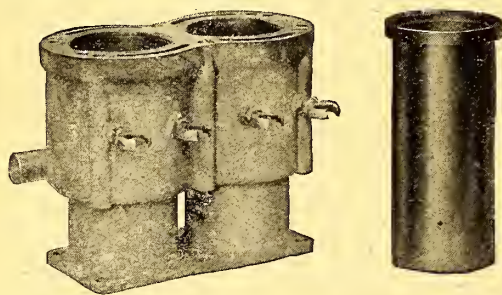
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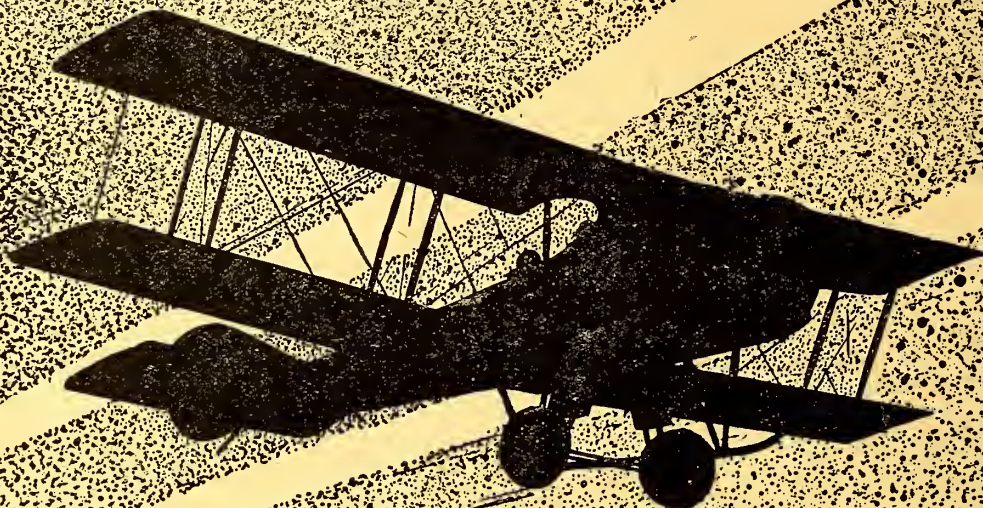
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ON STILL MORE MATTERS FOR THE AIR BOARD.

The other day a highly esteemed friend of mine who occupies a somewhat prominent position in aeronautical society told me a story with a moral, or several morals. In the dim distant days of his youth he was afflicted with literary ambitions, and among his friends was a famous authoress, to whom he confided his intention of writing a novel. This charming lady, being wise in the ways of the book trade, and recalling the classic jest, "Now, Barabbas was a publisher," made my friend a promise that if he would send her the first instalment of his book she would give him, of her wisdom, advice as to whether it would be likely to meet with the approval of the common or commercial publisher.

To her my friend sent what he in his wisdom considered to be the first and most important instalment, though in fact it is the last read portion of a book, namely, the preface, which read thus:

"Most novels are written with a purpose. The purpose for which this book is written is to make money."
 —(Signed) THE AUTHOR."

The lady survived the shock, and replied:

"It is true that this is an age of realism, but such realism as this is indecent. If you continue your book in the realistic strain in which you have begun, by the time you are half-way through it will become unprintable."

There are various lessons to be learned from that little story. Perhaps the most noteworthy is that, though honesty may be the best policy, honesty if carried to extremes does not pay, or may prevent itself from paying. Another is that too much realism may defeat its own object by preventing itself from ever seeing daylight.

To apply the argument to ourselves of this paper, if I started out by saying brazenly that THE AEROPLANE is run purely as a money-making concern I should lose the support of my esteemed readers, and consequently of our equally esteemed advertisers. And then where should we be? Instead I have to try to amuse people with more or less funny stories stolen from my friends. I have to give them news stolen from the four corners of the Earth, and I have to give them bits of technical information procured more or less nefariously from all sorts of places and people, in order to induce them to believe that they are acquiring really valuable knowledge. Then they buy the paper and read the advertisements, and so we scrape a living somehow. Which is about how and why most papers in the world exist—barring always those which are subsidised by some wealthy politician or other for the purpose of inoculating an innocent public with his poisonous views.

Of course, occasionally an editor's genuine keenness on his subject runs away with him, and he again offends against the natural law of commercial literature

by telling the truth about his subject instead of merely about his paper. And then he probably offends his owners' advertisers, or offends somebody who has influence over them, and so his paper loses advertisements in that way. Even this paper might have more advertisements if I had not been so careless as to tell the truth on one or two occasions. Truth-telling is a bad habit which I must endeavour not to acquire. So far, at any rate, I have successfully prevented myself from telling the whole truth; for at no time is it so dangerous to tell the whole truth as in war-time, when such things as the Defence of the Realm Act, which so often means the Defence of the Rulers Act, is in force.

Suppose, for example, I had been so foolish as to tell the whole truth about the affairs of the Flying Services a year and a half ago, in the hope of getting reforms carried at once. All that would have happened would have been that THE AEROPLANE would have been suppressed. A number of excellent agitators might have been hampered somewhat in their work. The Air Enquiry Committee might have had rather less evidence before it. And reforms generally might have been delayed still more than they have been. It sounds impossible, I know, but as a matter of fact quite a number of useful reforms now in operation might have taken longer to get through than they have done.

Anyhow, the great lesson is that the naked truth is the most indecent thing on Earth, besides being as dangerous as an unexploded shell.

BACK-STAIR INTRIGUES.

If it were not for the combined pit-falls of the Defence of the Realm Act and the Law of Libel, it would be possible to tell the Air Board the truth about quite a number of things which might give the honest and earnest gentlemen who are working so hard to increase the output of aeroplanes and engines the clues to delays and disappointments which doubtless puzzle them more than a little.

They must necessarily feel that things are happening somewhere between them and their sources of supply which are not as they should be. They are dependent on a descending scale of subordinates who may or may not be as competent as they could wish, or believe them to be, and the nearer they get to the aforesaid sources of supply the more difficult it must be for them to discover whether anything is really wrong or not.

ORGANISING INFORMATION.

It is fairly evident that if the most rapid progress possible is to be made in the design of engines and aeroplanes, for example, the producers of these commodities should have easy access to all existing information on their particular subjects. All the figures for experiments, calculations, and tests should be at

once available, not only between the departments under the Board, but between manufacturers and designers on the one hand, and the Departments and experimental establishments under the Board on the other.

In theory such figures may be accessible to all authorised persons, but how can Lord Cowdray or Sir William Weir tell whether some would-be clever young men are not storing up official information for their own personal use after the war, when they will find themselves under the painful necessity of finding employment with mere commercial firms? Very little such hoarding up of information, whether for personal gain or out of departmental jealousy, would be likely to affect seriously the quality of the machines concerned, even if it did not affect the quantity.

There should, in fact, be a properly organised system of publicity by which all information likely to improve engines or aeroplanes would be circulated to all designers and producers in the Aircraft Industry. A reasonable amount of control would have to be exercised over such information in the course of its circulation, to prevent it from reaching the enemy, though it is hard to see how such information could be smuggled out of the country in sufficient quantities to be of any value to the Hun, and it is still harder to see what particular value it could be to him until we establish a more decided superiority over German design than we have at the moment.

A SENSIBLE OUTLOOK.

In any case, if a little information did leak across, it would probably be of less value than that imparted by our generous way of accidentally presenting to the Hun samples of our very latest machines, as apparently is still the custom, if certain stories of the early days of the fighting in the Arras region are to be believed. Moreover, if the British Aircraft Industry is incapable of putting such information to practical use before the enemy has time to use it, then it is time we made peace on any terms and started to reorganise our whole national outfit in preparation for the next war.

I well remember, during my young days in a manufacturing firm of the most hardened English type, being shocked and at the same time enlightened by an American engineer, who had as a great favour obtained permission to go round our works with me, telling me that he never minded showing his keenest rival round his works, for, said he: "If he finds anything new in my works it will take him six months to put it into operation in his own works, and if it is any use to me in six months' time—well, I guess it will be time for me to quit business."

That is a very useful outlook on commercial life, and it applies very well to still bigger affairs in war-time. Having had some twenty-five years' experience of various manufacturing industries, each in turn the most progressive of its period, I do not hesitate to say that the Aircraft Industry is the most progressive and the most intelligent of all. Which is only natural, when one considers that until two years ago only people possessing a wealth of imagination, great initiative, and considerable moral and physical courage, had any part in the making of aeroplanes. Therefore I dare swear that, given a free hand, unhampered by officious officials, and encouraged by men in authority who are determined to urge forward both design and output of aeroplanes, the British Aircraft Industry can easily beat the Germans, even supposing the two started level with some new and epoch-making aerodynamic discovery.

That being so, there is every reason for giving British designers all the information possible, whether obtained at the Nation's expense or otherwise, which can assist them in improving their own machines:

A TEST CASE.

If Lord Cowdray wants to satisfy himself whether such information is being circulated to the British industry or not, let him take a very simple test case. It is now some months since a German "chaser" of their very newest type, a D.1 Albatros, fell into the hands of the British Army. It possessed many new and interesting features, some of which seem well worth copying, and, anyhow, accurate information as to its actual performance in the air and its general aerodynamic features would be of considerable value to British designers.

Let Lord Cowdray find out when, if ever, technical information concerning that new enemy machine was circulated to the British Aircraft Industry. Thanks to the courtesy of our valued French contemporary "*L'Aérophile*," which is kept well informed by the Service d'Aviation Militaire, *THE AEROPLANE* was able to publish a brief description, some photographs, and some general arrangement drawings of this machine, but only many weeks after all that information and a great deal more should have been circulated by the Design Department of the Air Board.

This week I am able to publish some photographs of German twin-engine biplanes, reproduced from photographs taken by the Germans themselves and circulated in neutral countries for the glorification of Germany. At least one of the types illustrated has been in the hands of the British Army for months. Have any particulars concerning it ever been circulated to the Industry?

ENGINE INFORMATION.

Let Lord Cowdray take another instance. Again some months ago, a new type Albatros with a Mercedes engine, on which a German princeling of some note was travelling, was captured in the Eastern war area. That engine was a new type of well over 200 h.p. A six-cylinder-in-line engine of such power was not, at that time anyhow, among our national products. The figures respecting that engine would have been of high value.

Have such figures ever been issued to the British Aero-Engine Industry? Does any British designer know the physical properties of the 200 and odd h.p. Mercedes? What are its bore and stroke? What is its compression? What is the capacity of its combustion chamber? Of what grades of steel are its various parts composed? If all that information, and a great deal more, is not in the possession of all British designers, why is it not?

Some considerable while ago our Italian Allies captured intact an Austrian-built Aviatik with a Hiero motor, designed, I believe, by the old racing driver Hieronymus, and made by Warcholowski, of Vienna. How many British designers know anything about the Hiero motor and its interesting valve arrangements? How many have ever heard of such a motor?

Is it nobody's business to find out what the enemy's engineers are doing and to tell our engineers all about it? Have we no such thing as an Intelligence Branch in the Air Board's Engine Section, or Design Department? Or is it too much to expect intelligence from British Government air experts?

UNEMPLOYED TALENT.

Quite a long time ago one of the cleverest artists connected with motor journalism was acquired by one of the Flying Services for the express purpose of collecting and recording all the latest ideas in aeroplane and engine design. What has been done with that artist's work? Has any of it ever been circulated among British designers for the improvement of the breed of British aeroplanes? Or is it all being stored away for official use only, so that the despised "Trade" may suffer in due course? This artist might be worth thousands of pounds a month to the Nation if he were

properly used as a means of conveying the latest French and German ideas to the British Industry.

How many British engine designers, again, have any accurate information concerning the properties and performances of such familiar engines as the Renault-Mercédès, or the Hispano-Suiza? In peace-time rival firms would have all this information, by the simple process of buying examples of these engines in the open market and finding out for themselves. To-day it is impossible to buy engines. Yet without such information, given fully and accurately, how can an aeroplane designer hope to produce a machine which will give the best results with such an engine?

DISSEMINATION OF KNOWLEDGE.

Therefore it seems to be the very simple duty of the subordinate officials under the Air Board to circulate all such information throughout the Trade at the Government's expense, so that every draughtsman and designer in every factory concerned with such matters shall be educated to the highest possible pitch.

Perhaps Lord Cowdray may find it worth while to ask why these things are not done, and to ask whether the omission is due to mere incompetence or to a deliberate desire to hide away technical information, so that the figure-hoarders may use it for their own benefit, just as if they were food-hoarders. In time of war it appears to be as unpatriotic to make a corner in technical knowledge as it is to make a corner in food-stuffs.

BOOMING OFF IDEAS.

One cannot help feeling suspicious in such matters when one learns of the treatment meted out to people who have really good ideas which seem worth developing. I know at the present moment of at least three engines of unusual promise which have been consistently "boomed off" time after time. Two at least of them are far past the experimental stage, and on test figures seem to be distinctly steps in the right direction. Yet every time the people concerned attempt to reach officials who are in a position to order that their designs shall be given a thorough trial they bump into a set of buffer-officials, who prevent them from getting through to the fountain-head.

I have myself seen some of the letters sent by officialdom to these designers, and in one case at least the technical reason given for turning the engine down showed clearly that either the writer of the letter had never taken the trouble to understand the principle involved, or else that he was ignorant of the most elementary principles of internal combustion engines.

We have indeed come to a lamentable pass if we are going deliberately to turn down possible improvements in the hopes of preventing them from interfering with vested interests, or if we are going to find ourselves again in the old evil position of the same officials being at once the competitors with and judges of new designs. And yet one cannot feel confident that such is not the case, when one knows that official designs are being pushed along at full speed. I submit that the official design department and the official test department should not only be entirely separate, but should be as far as possible in opposition to one another, so as to promote the keenest possible competition.

It would not matter so much if those who are responsible for the official designs had ever in their lives produced anything worth having. But when one knows that the whole record of official aero-engine design is one long lamentable history of abject failure: and when one knows that the making of official engines has only resulted in the delaying or hanging up of better designs which despite official discouragement have enabled our active-service aviators to do their best work, one despairs of ever seeing an official production which is

of even mediocre quality. And the best in the world is none too good for our active-service aviators.

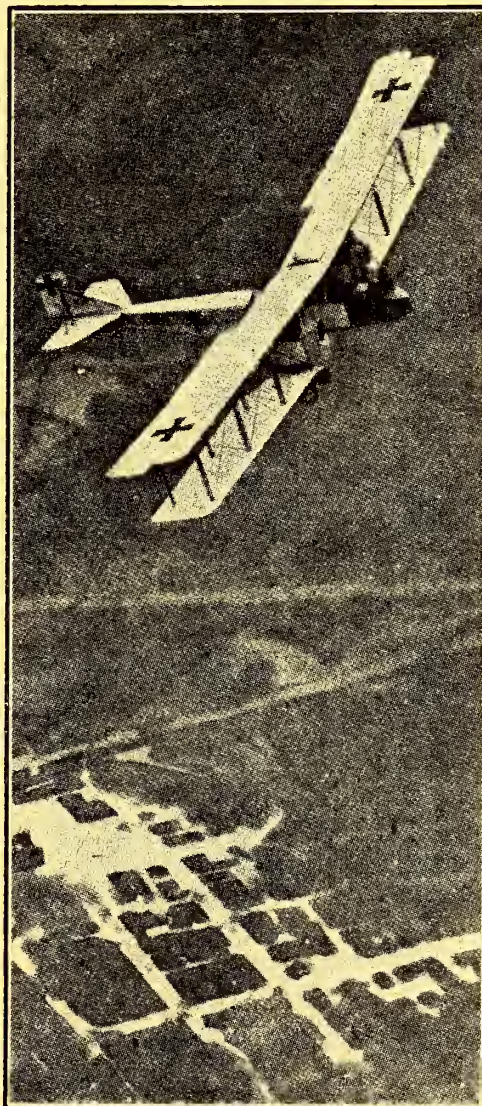
SECRET PROCESSES.

In other directions also persistent rumours of unrest as regards the intentions of Air Board officials are prevalent, and Lord Cowdray would do well to investigate their causes. One hears through divers ways that makers of proprietary articles, such as dopes, aeroplane varnishes, and special glues, have been constrained to reveal the secret processes by which the peculiar properties of their products are attained.

It will be remembered that some time ago a regulation was issued, or was about to be issued, under the Defence of the Realm Act, ordering that secret formulæ should not be withheld from Government officials concerned with the use of the products of such formulæ. This regulation was so obviously open to abuse that strong representations were made by the Chemical Industry, and the obnoxious regulation was withdrawn. Nevertheless there still exists the possibility of undue pressure being put upon firms to reveal their formulæ to officials desirous of obtaining such knowledge, and one invites the Air Board to investigate the question of whether such pressure has been exerted by its officials.

A CASE IN POINT.

It is alleged that early in this year the proprietors of a certain brand of glue, much in favour among



From a Photograph received from a Neutral Country.
A GERMAN BOMBER.—A twin-engined Göttha biplane. The balanced ailerons and rudder are noteworthy.

makers of air-screws, received an invitation to reveal to a Government department the precise composition of their product. One imagines that the invitation was gracefully declined, as it seems unlikely that a firm which has evolved a secret process at great trouble and expense would feel inclined to impart its formula to officials who would have it in their power either to announce the secrets of the process to the world at large, or to pass it on to other firms.

If the invitation was in fact given, it would be interesting to ask the result of the refusal. One might ask, for example, whether an order was issued that henceforth glues of unknown composition, even though of proved efficiency, should not be used for propeller making, and whether the glue in question was removed from the list of "approved brands," despite the fact that it had been used with conspicuous success under the most trying tropical conditions?

It would also be interesting to ask whether it was officially ordered that this special brand of glue was not to be thinned with added water, despite the fact that the makers had issued directions recommending water as a dilutant, as the result of practical experiments carried out by an eminent aircraft constructor? It seems that water may be used with ordinary cake glue, although it is not concentrated as is the case with the brand in question.

It would also be worth while to ask whether the prohibition of this glue extends to propellers for both Services, now that the inspection for both is under one department, and, if so, how it is that one Service or the other has had to wait for the amalgamation of inspection before discovering its demerits.

Furthermore, it would be well to inquire whether, on the refusal of the proprietors to supply their formula, endeavours were made to obtain the information indirectly either by insisting upon the inspection of raw materials or any other means? One fully appreciates the official desire to ensure uniformity of quality, but one suggests that this could equally well be determined from tests made on samples from each boiling.

POSSIBLE MOTIVES.

If such or similar pressure has been brought to bear there seem to be four possible underlying motives.

(a) A laudable desire to acquire information concerning trade secrets with a view to assisting the proprietors to improve them.

(b) A desire to acquire such information as a basis for experiments in the hopes of discovering something better, for the glorification of the department concerned.

(c) A manifestation of pure officialism, in the desire to display authority.

(d) A desire to hand the secret over to rival manufacturers.

The last motive is almost unthinkable, but the others are bad enough in principle to render such action extraordinarily bad policy. Therefore in any case the whole question should be thrashed out by the Air Board, if it desires to remove the ill-feeling and suspicion which undoubtedly exists in certain directions. The power conferred on minor officials makes it possible for them to exercise pressure which may amount in effect to the use of that useful Irish weapon the boycott against any manufacturer who does not happen to be personally pleasing to any given official, and steps should be taken to guard against the use of such pressure, which may be seriously detrimental to that increased output which the Air Board so much desires.

SOME TECHNICAL POINTS.

Incidentally, on a purely technical point, the Air Board would do well to ascertain wherein lies the objection of some officials to the gluing up of all the laminæ of a pro-

PELLER *en bloc*, and why they still insist on the time-wasting process of gluing up each lamination separately. And better still, it might be asked, why certain firms are forced to abide by official instructions and why others are allowed to do precisely as they please.

In yet another direction it might be well to investigate the reason for insisting on certain "doping schemes," whereby dope-making firms have been obliged to set up as varnish makers, thus causing the expenditure of much money on new machinery and plant, and waste of time in teaching the varnish-making trade to a lot of new hands, when existing firms who have been in the varnish trade for years are quite capable of supplying everything that is needed, both in quantity and quality, without increasing their plant and with very few extra hands.

Surely it is better to use existing facilities to their full instead of setting up a lot of new businesses to compete with those already established. And just by way of showing how unnecessary are many of the rules and regulations now issued, it is possible to point out one manufacturing firm which has a record second to none as regards the durability of its machines on active service, which insists on going its own way to work, and produces results demonstrably superior to those achieved by the officially approved method.

A REGRETTABLE NECESSITY.

It is truly regrettable that after all this time it should still be necessary to keep on criticising official methods. I do not for a moment question the advisability of employing in Government departments the ablest scientists available, though one cannot help feeling that so far as commercial scientists, as distinct from the scientists of the Universities and public institutions, are concerned the ablest of them are in the employ of the big commercial firms. But I do say, most emphatically, that the laboratory scientist should not be permitted to interfere with commercial production.

Can one imagine, for example, any big steel firm permitting its laboratory staff to issue orders to the furnace managers, or to take charge of the buying of its raw material? The laboratory type of mind is congenitally incapable of envisaging the problems of output. For instance, a high-browed entomologist, complete with triple-expansion slide-valve microscope and specimen boxes as fitted, might make many interesting discoveries in a vermin-infested trench, but for purposes of output one would prefer a soldier with a hose-pipe and a tin of Keating's.

THE EVILS OF COALITION.

If the Air Board is not very careful it will find itself producing evil effects precisely similar to the evils of a Coalition Government. Under the old much abused Party System if a Government department did anything particularly foolish there was always a solid body of Opposition ready to raise a row about it, and the Government was obliged in self-defence to put that department straight at once. Does anybody imagine, for instance, that the continual idiocies of the Food Controller's department would be permitted for a week if there were a strong Opposition Party eager for every chance of exposing official foolishness?

Under a Coalition Government the men in office are so busy keeping their respective parties in order and in preventing disorderly followers from breaking out as critics, that they cannot devote their whole time and energy to their work of national importance, and when a critic does break out he is promptly sandbagged by the whole weight of the jacks-in-office of both parties supported by their controlled Press. The case of the Air Board may become almost as bad unless Lord Cowdray takes up a very strong position.

FREE COMPETITION.

When the two Flying Services were in opposition to

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one another the consequent free competition was good for new ideas. If a new aeroplane or a new engine, or a new glue, or a new dope was turned down by one Service there was at least a sporting chance of it being taken up by the other. The mere fact that it had been turned down by one predisposed the other in its favour, because if the other took it up and made it a success the laugh was against the Service which had turned it down. As, for example, when the Navy got first-class results out of Sopwith and Nieuport aeroplanes and Clergét and Le Rhône engines after they had been turned down by the Army.

Suppose there had been in those days a single design and test department under an Air Board, one and indivisible, the whole lot would have been turned down, and the factories which are now producing hundreds of our best aeroplanes and engines would probably be now turning out B.E.2cs. and 90-h.p. R.A.Fs., as is still being done by so many excellent workshops which ought to be better employed.

I strongly commend to Lord Cowdray the consideration of the case from this point of view. He has very many extremely able men under him, but the ablest are not necessarily the most powerful. In some cases the ablest men are junior in rank to singularly obtuse seniors, and so are at a greater disadvantage than if they were mere civilian clerks or draughtsmen.

The removal of the spur of competition between the Services makes Lord Cowdray's task still more difficult, and there is the greater need for him to introduce some

form of internal competition which will permit good men and good things to come to the top by sheer merit, so that his department may break away from the old evil common to all Government offices, in which incompetent seniors band together to cover up one another's mistakes and keep their more able juniors from proving their worth for fear lest these juniors should supplant them in their jobs.

LORD COWDRAY'S OPPORTUNITY.

Lord Cowdray has a better opportunity than most chiefs of departments, in that several of his senior officials, at any rate on the technical side, are as able as anyone to be found at their particular work, but none the less, he has a very difficult task before him. He has the good wishes of everyone concerned with aeronautics. The Aircraft Industry is most anxious to back him up in every possible way, and he is assured of the enthusiastic support of employers and employees alike, for the Trade, despite its pre-war treatment by officialdom, is full of the desire to do its best for our active-service aviators.

Lord Cowdray's difficulties lie within his own department. I have ventured to indicate, without too much realism, some of the directions in which those difficulties are to be found. So far as certain instances at which I have hinted are concerned, I shall be pleased to give him personally the names and addresses of the people connected with these instances, provided he thinks it worth his while to investigate them further, but I do not propose to hand them over to the tender mercies of any buffer officials.—C. G. G.

COMMERCIAL AERONAUTICS IN BEING.

The lecture on "Commercial Aeronautics," which is to be delivered by Mr. G. Holt Thomas at the Central Hall, Westminster, on Wednesday next, May 30th, should certainly not be missed by anybody who intends to continue in the Aircraft Industry after the war. The writer has had the opportunity of discussing some of the subject-matter of the lecture with Mr. Holt Thomas, and can promise those who have the good fortune to obtain a seat in the Hall, a highly entertaining evening.

It is not the intention of Mr. Holt Thomas to inflict upon his audience a long string of figures demonstrating the financial possibilities of commercial Air Services, though one hopes he will produce something in the way of financial figures in support of his arguments, but it is rather his desire to show to the ordinary follower of aviation, and, perhaps, even more especially to the general public, who are merely interested in flying, that passenger and mail services by air are perfectly ordinary propositions.

To demonstrate this he has prepared at very considerable trouble and expense some of the most convincing kinematograph films imaginable. One film shows all the stages of passenger transport on a London and Paris Service, including the arrival of the passengers at the Transaerial Packet Station, the transference of passengers and luggage from the station to one of the great aerial liners, and the departure of the said aerial liner for Paris, and some extraordinary pictures taken from and in the machine.

There is a similarly interesting film showing the embarkation of passengers and mails on an oversea flying boat of enormous size, and the departure of the said boat for a long journey.

There is no fake about the pictures in the ordinary sense of the term. That is to say, the number of passengers put into any of the machines is only the number that such a machine has actually carried, and the machines which are seen in the air are actually the same machines which are seen on the ground or on the water.

There are also very interesting films of high speed postal aeroplanes at work in the dispatch and reception of mail bags. In fact, all the films are simply a glimpse into the near future.

Mr. Holt Thomas' qualifications as a prophet are indisputable, as is proved by the enormous success of his various ventures into the construction of aircraft, the foundation of which successes were laid just those few years ago when the embarkation of capital on such ventures was regarded as little short of lunacy by those who were without faith in aviation or the gift of prophecy.

The Aeronautical Society is to be congratulated on having had the courage to engage the Central Hall at Westminster for this lecture, and it deserves the thanks of everybody interested in aviation for spending in the public interest the very considerable amount of money necessary to provide such a free entertainment in the interests of aeronautical propaganda.

There is naturally an enormous demand for tickets for this lec-

ture, but those who apply promptly can still secure seats. Applications for tickets and reserved seats—both of which are free—should be made at once to Mr. W. Barnard Faraday, Secretary of the Aeronautical Society of Great Britain, 7, Albemarle Street, Piccadilly, W.1.

OUR GALLANT ALLIES.

One has heard so little of the French Naval Air Service, since some few incidents in its work were mentioned in the early days of the Egyptian campaign, that the following story, which came recently from France, deserves to be known more widely.

Not very long ago a British aeroplane was brought down by the Germans on the coast of Flanders, and was forced to descend in the sea a couple of miles from the shore. There it floated helplessly, while every German shore battery within sight turned its guns onto the machine in the hopes of destroying it utterly.

The German shooting was all too good, and the sea round the target was afoam with bursting shells, besides bullets from machine-guns which were brought down to the water's edge to help the job of destruction. The crew had made up their minds that they were finished, when suddenly two French seaplanes appeared in the sky and proceeded to land calmly and collectedly in the middle of the fire-zone.

One of the French machines picked up one of the crew of the British machine and made off. The French pilot had brought a passenger with him, presumably so as to have someone to start up his engine again if it stopped, and consequently the French seaplane, albeit only a little one, had to carry three people. Nevertheless it struggled gamely off the water, and brought its load safely into harbour. When it arrived it was found to be as full of holes as a sieve, several adjacent ribs had been knocked clean out by a shell, and the whole thing was a wreck, but it had, in spite of it all, fulfilled its purpose.

The other French machine was, unhappily, hit in some vital part before it could get away, and ultimately was towed ashore by the Germans, with the wreck of the British machine, the personnel of both being taken prisoners, so it cost our Allies two men to save one of ours.

The action of the French aviators was a piece of cool and deliberate gallantry which can only be described as "a pure V.C. job"—to use the phrase of one who was there. So far as one can gather, the Frenchmen did not act on the spur of the moment, as one might have expected them to do if they had come across a machine in distress while out on patrol, but they deliberately put out of harbour to make a rescue, on being told of the predicament in which the British machine had been observed by the pilot of a land machine which could not reach them.

The successful French pilot, on being congratulated and thanked for his gallantry, merely remarked, "It is nothing! You will do as much for us when we are in need of help." Assuredly one could not find a better example of a cordial alliance.



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TRADITION.

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On many occasions recently questions have been asked in Parliament in regard to the publication of the names of officers in the Royal Flying Corps who have been fortunate enough to distinguish themselves in the execution of duty. Members whose flights of oratory give them a peculiar sympathy for those whose military paths lie in the skies are personally affronted because the daily news-sheets are prevented by an unduly autocratic Government from printing impassioned periods on the persistent pluck and resource of some flying officer whose ways have led him in the road of the German.

Plaintive appeals are put forward daily that the dim obscurity of the initials so loved by the Air Board shall be extended into the glowing fulness of a name, that local enthusiasm may be animated and the whole world be gladdened.—*En parenthèse*, be it remembered that for the duration of the war the Central Empires are not held to be a portion of the civilised globe.—These members hold it righteous that those to whom great deeds have been possible and who have not neglected to avail themselves of the opportunity should receive their due meed of fame.

It is not given to members of Parliament that they should have the historic vision. Their ways are not Olympian, and intelligence is not to them a necessary attribute. "It is only people who look dull who ever get into the House of Commons, and only people who are dull who ever succeed there!" It is not to be expected of them that as a class they should have any knowledge of those principles which should animate an army in the field if its spirit is to combine with its system in the gaining of ultimate victory.

ALL SORTS AND CONDITIONS OF MEN.

An army in the field is composed of all manner of units, each built in its way from all manner of men. The officer at the desk is of no less importance than he whose work is in the trenches. The regimental cook has as great an influence on the gaining of victory as has the leader of a bombing party whose work is in the firing line. Moral courage is no less worthy of praise than is the courage which finds its reward, if seen, in the Victoria Cross.

The Army Service Corps, working steadily day by day in the unpleasant obscurity of the areas behind the lines, is no less essential to the general progress of the troops than is the gallant officer who is fortunate to find death while leading his men in an attack on a position which has been regarded as impregnable. That history is unkind in its records should never be forgotten.

Those who served the guns at Fuentes d'Onor are remembered, while the troops who held inviolate the the lines of communication are forgotten. The story of the charge of the Light Brigade is an epic in the life of all English children, but it is only he who reads history more closely who knows of the Heavy Brigade who came into action on the same day and achieved at equal loss a greater result.

VICARIOUS HONOUR.

There is none with knowledge who would readily belittle the worthiness of those to whom honours have come in the course of their warlike career. But there are few who invariably regard these rewards as a recognition not of individual gallantry but of the credit attaching either to the regiment or the army concerned.

Success in war does not come because of the indi-

vidual but because of the mass. Co-ordination and not individually is the secret which brings victory. Those who receive rewards are more fortunate and not necessarily more worthy than all others.

THE MEANING OF TRADITION.

The newer units in a service, especially those which have come to life so recently that the present war is their first experience of the reason which gives them birth, are not always willing to realise the value or to understand the meaning of tradition. To many the word indicates all those things which impose a speed limit on the motorist or discourage vehemence of spirits in public places.

To them it means something antique and mouldy that was all very well when it was possible to drink six bottles of port at a sitting, but is sadly out of place in a world that spells Liquor Control in capital letters and lives in careful recognition of the Nonconformist Conscience. In reality it is something far different.

The great regiments of the day hold their proud position not altogether because of the officers and men who are at present borne on their strength, but as a result of the lives and opinions of those who in previous decades followed the regimental colours into action or upheld their honour in the stagnation of peace.

In pursuance of the decrees of Nature, no man's life is entirely individual. He is but a unit of a race with the attributes and virtues of those of his line who have gone before. The noblesse of France who died under the guillotine during the troubles of the Revolution ended their lives in calm splendour because the tradition of their line was with them still. As with a noble house so it is with a regiment. Each successive generation throughout the history of the corps adds something to the manner of its life. It is no discredit to the newer units to admit that a regiment with great traditions is more to be relied upon in the stress of action than is one that possesses no history to hold it away from shame and to inspire it to ceaseless effort.

REGIMENTAL GENEALOGY.

There are many regiments in the British Army which trace their history from the end of the seventeenth century, the date at which a standing army was first recognised as a necessary part of the national body. Some indeed are older, as for instance the Scottish regiment which is under suspicion of having at one time been the Body-Guard of Pontius Pilate, an early Colonial Governor whose methods survive until to-day.

Among them, to quote a case, is one founded in the last years of the reign of King Charles II., whose genial memory should be venerated throughout the ages. In its earliest days it found the greatest trouble that can afflict any community, the conflict of opinion. King Charles was succeeded by his brother James, whose early brilliance on sea and land was succeeded by a religious bigotry which soured his later years. It saddened his life and lost him his throne.

In his desire for ultimate salvation he rejected the principle of tolerance and desired to restore Great Britain to its ancient allegiance to the See of Rome. It was not possible to dominate the entire nation in the first instance, and he therefore ordained as a beginning that the officers of his army should testify not only their allegiance to him, which was undoubted, but their adherence to the old faith.

The company commanders of the regiment in question, eight in number, after severe searching of heart, refused to retain the King's Commission if a change of faith was



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a necessary condition. They were therefore placed under arrest as were the seven Bishops now better known to fame. The English Revolution came too quickly for them to be sentenced, and they were restored by William III to the ranks they had resigned. They had demonstrated their firmness of conviction without disloyalty.

THE LINEAL SUCCESSION.

With them, if the history of the regiment be read, were subalterns who at a later date fought with the regiment under Marlborough in Flanders. At Blenheim, Ramillies, Oudenarde and Malplaquet they upheld the honour of the corps not unanimated by the principles inculcated in them by those officers under whom they gained their first knowledge of the military art. As they grew older another generation grew up with them, wearing the same uniform and subscribing to the same principles of strict loyalty in conformity with honesty.

To this generation in the regiment there gradually succeeded another also versed in the same training. These fought at Dettingen and saw the Gardes du Corps of the King of France exchange chivalrous compliments with the Grenadier Regiment of Foot Guards of England before opening fire.

To be in constant touch with chivalry is to acquire some of its qualities, and it is not too much to expect that those of the regiment who were subalterns at Dettingen, when they in turn grew older, gave half unconscious training to those who came after in all these matters touching the propriety of a soldier's life. And so through the years the regiment passed on, fighting beyond the seas in Canada and New England, and later under Queen Victoria on the plains of India, each generation imperceptibly succeeding the last and the same train of thought ever ripening but ever continuous in the corps. And so to the field of Mons in the present hostilities.

FROM GENERATION TO GENERATION.

Under these circumstances is it too much to expect

that this manner of "Apostolic Succession" in regimental life has had a great influence in the acquiring of merit by the regiment in these present days. Every officer in the regiment to-day has spoken to officers of the corps who, when they were young, were on friendly terms with officers also in the regiment who fought in the Mutiny, wearing the same badges and bearing the same tradition as their successors of to-day. Those in the Mutiny had known in their turn officers of a previous generation and so the constant association continues into history to the days when the regiment was formed.

To those regiments which are newer and with whom the spirit but not the tradition is present, the lesson to be learnt is that the corps counts and not the individual enrolled therein. His every step should be directed in such manner that his action should bring no discredit on the unit of which he is member. The gallant deeds of the individual are to the fair fame of the regiment rather than for his own aggrandisement.

ONE FOR ALL.

Those who are so anxious that the Government should depart from its present principle of refusing to advertise the officer or man of the Royal Flying Corps who has by conspicuous gallantry acquired merit, would be well advised if they realised the splendour of the theory which subordinates the individual to the glory of the corps.

Those of the Royal Flying Corps who may be intoxicated a little by the freshness of experience in aerial warfare should also remember constantly that all done by them as individuals reflects in one way or another on the credit of the regiment. Individual bravery in warfare will bring credit to the regiment, but none the less surely improper behaviour in public places and a careless superiority of manner when away from the restraining discipline of a well ordered mess will lower the reputation of the whole corps.

THE AERONAUTICAL SOCIETY OF GREAT BRITAIN.

OFFICIAL NOTICE.

Notice is hereby given that the annual general meeting of the Aeronautical Society of Great Britain will be held on Wednesday, June 13th, 1917, at 7.0 p.m., at the offices of the Society, 7, Albemarle Street, London, W.

AGENDA:

To receive and approve the report of the council on the state of the Society, and the Balance sheet of Aerial Science, Ltd.

To discuss and determine such questions as may be proposed by the voters relating to the affairs of the Society, and to fill the vacancies on the council for the ensuing year. Any voter desirous of proposing any subject for discussion at the annual general meeting shall give notice in writing to the secretary, which shall be received by him by noon on May 29th, 1917.

The retiring members of the council are:—A. E. Berriman; B. G. Cooper; Alec Ogilvie, Wing Commander, R.N.; Mervyn O'Gorman, C.B., Lt.-Col., T.F.; F. Handley Page; H. E. Rawson, C.B., Colonel; Dr. A. P. Thurston, Lt., R.F.C.; G. Aldwell, Acting Wing Commander, R.N.; who are eligible for re-election.

Nominations of candidates for election to the council shall be signed by the voters proposing them (two voters and no more), and must be received by the secretary by noon on May 23rd, 1917, with an intimation in writing by the voters nominated that they are willing to serve.

An amendment to Rules 4 and 23 will be proposed by the council to the effect that fellows and associate fellows may be elected by the council and need no longer be elected on ballot by the voters of the Society.

The council will also ask for approval of their action in postponing, on account of the change in the offices, the date of the annual general meeting.

Council attendances for year 1916-17 up to meeting of April 19th, 1917. Meetings called, 16.

*A. E. Berriman, 50, attendances, per cent.; *Griffith Brewer, 75; *J. H. Ledebor, 33; *F. K. McClean, Flight Commander, 0; *Alec Ogilvie, Squadron Commander, 0; *Mervyn O'Gorman, C.B., 75; *F. Handley Page, 87; *Col. H. E. Rawson, 0; *Lt.-Col. Bagnall Wild (elected, vice Col. F. H. Sykes, retired), 33; Maj.-Gen. R. M. Ruck, C.B., 80; *Lt.-Col. F. H. Sykes (retired), 0; *Dr. T. E. Stanton, 25; *Dr. A. P.

Thurston, 70; Dr. R. Mullineux Walmsley, 25; †Actg. Wing Comdr. G. Aldwell, R.N., 0; *A. R. Low, 33; *Harris Booth, 37.

* Technical side.

† Due to retire March, 1917.

By order of the council (signed), W. BARNARD FARADAY, Sec.

RAMSGATE'S QUALIFIED THANKSGIVING.

A thanksgiving service for the preservation of Ramsgate from repeated danger was held on May 17th, the second anniversary of the first Zeppelin raid, in the parish church.

The Vicar, the Rev. E. Hertslet, said that for two years Ramsgate had been miraculously protected by God, though their protection in other ways had not been very obvious. The town had gained through the troubles, because reliance on God was better than reliance on the "season."

One commends the Vicar for the delightful implied dissociation of the constituted authorities from the thanksgiving.

OBVIOUSLY.

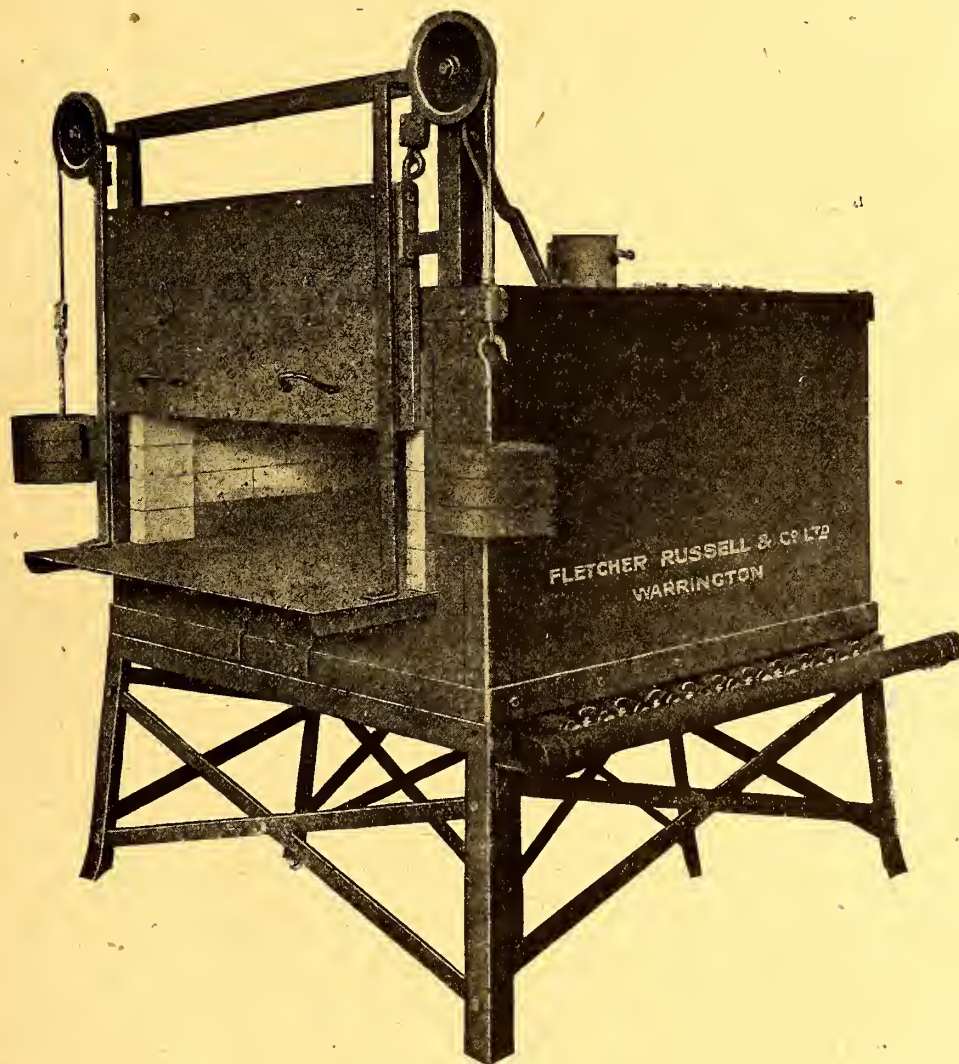
On May 15th, the "Figaro," of Paris, writing of the bombardment of Zeebrugge, says:—

Foresight would have dictated an unceasing renewal of the attacks on Zeebrugge. The enemy should have been harassed there and allowed no rest. The attacks should have been persisted in until the new naval stronghold had been destroyed. But a contrary view has prevailed. Operations have only been carried out at periodical intervals. The fear of the losses that might be incurred paralysed any energetic and continuous action. In war no success is obtained without losses. All that it is necessary to know is whether the losses to be reckoned with are worth the result to be achieved.

Who could doubt the capital advantage the Entente would have obtained with Zeebrugge annihilated and made unfit to serve as a base for the German fleets? We hope that the combined attack on Zeebrugge on May 12th will be followed up immediately, until some tangible result has been obtained by constant attacks of the same kind, bringing into action all the aerial and maritime means at the disposal of the Allies. There should be no more of these periodic attacks, which accomplish nothing, or very little.

[Vide Mr. Pemberton-Billing in the House of Commons any time for the last year or so. Also note the official rebuffs to his questions on the point.—Ed.]

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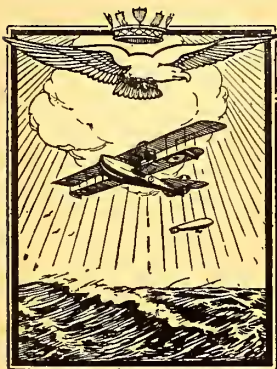
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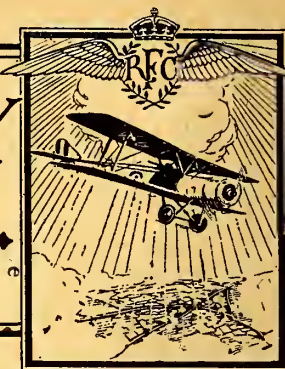
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FROM THE "LONDON GAZETTE."

WAR OFFICE, May 15th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.

—Flt. Comdrs.—From Flying Officers, and to be temp. Cpts. whilst so empld.:—Temp. Lt. A. T. Hope, Gen. List, April 30th. Sec. Lt. S. W. Taylor, Spec. Res., May 2nd.

A supplement to the "London Gazette," dated May 15th, contains a second instalment of the dispatch from Sir Douglas Haig, published on May 15th (see THE AEROPLANE, May 16th), and mentions the names of the following officers and men of the Royal Flying Corps.

ROYAL FLYING CORPS.

Ainslie, Lt. (temp. Capt.) E. M. L., Midd'x R. Bailey, Sec. Lt. (temp. Capt.) G. C., D.S.O. (Spec. Res.); Baker, Capt. F. C., D. of Corn. L.I.; Barratt, Capt. (temp. Maj.) A. S., M.C., R.F.A.; Barton, Capt. R. J. F., R. Sco. Fus.; Beal, temp. Sec. Lt. L. W.; Bird, temp. Capt. A. W., Gen. List; Bird, temp. Lt. C. B., M.C., R.F.A.; Boulbee, temp. Sec. Lt. (temp. Capt.) B. St. J., Gen. List; Bower, Sec. Lt. F., North'd Fus.; Boyle, Capt. (temp. Lt.-Col.) Hon. J. D., Rif. Brig.; Brearley, Sec. Lt. (temp. Capt.) N., D.S.O., M.C., L'pool R.; Brown, Lt. F. E., R. Dub. Fus.; Buck, Lt. G. S., Lond. R.; Bullen, Sec. Lt. (temp. Capt.) T. F., Som. L.I.

Cadwell, Sec. Lt. (temp. Capt.) K. L., Spec. Res.; Capel, Lt. (temp. Capt.) A. J., Som. L.I.; Chappell, temp. Sec. Lt. R. W., Gen. List; Child, Sec. Lt. (temp. Lt.) J. M., Gen. List; Clement, temp. Capt. C. M.; Cogan, Maj. (temp. Lt.-Col.) F. J. L., R.F.A.; Cooper, temp. Maj. R. A. (Lt. (temp. Capt.) Yeo.); Corballis, Capt. E. R. L., R. Dub. Fus.

Davidson, temp. Capt. J. F., Gen. List; De Ross, temp. Lt. A. G. S., Gen. List (killed); Dowling, temp. Capt. B. L., Gen. List.

Faithfull, Lt. (temp. Capt.) G. F. H., Ind. Army; Fell, Capt. (temp. Maj.) L. F. R. (Spec. Res.); Frost, Sec. Lt. (temp. Lt.) O. H., Midd'x R.; Frost, Sec. Lt. (temp. Lt.) S. G. (Spec. Res.).

Garland, temp. Sec. Lt. E. J., Gen. List; Gilmour, Sec. Lt. (temp. Lt.) J., Arg. and Suth'd Highrs.; Godman, Maj. A. L., York R.; Goldsmith, Lt. (temp. Maj.) N., R.A.; Gould, Sec. Lt. (temp. Capt.) J. R., King Edward's Horse (Spec. Res.).

Hall, Sec. Lt. (temp. Lt.) R. W. P., R.F.A.; Hearson, Bt. Maj. (temp. Lt.-Col.) J. G., D.S.O., R.E.

Jerman, Lt. (temp. Capt.) R. H., R.W. Fus.; Jones, temp. Lt. C. G. (Spec. Res.); Jones, temp. Lt. R. N. K.

Landon, Capt. (temp. Maj.) J. H. A., Essex R.; Lindquist, Sec. Lt. O., Spec. Res.; Long, Lt. (temp. Capt.) S. H., D.S.O., M.C., Durh. L.I.; Loraine, Capt. (temp. Lt.-Col.) R., M.C., Spec. Res.

M'Alery, temp. Lt. (temp. Capt.) J. M., Gen. List; McMillan, Sec. Lt. (temp. Capt.) J. C., R. Sco. Fus. (died of wounds); Mulock, temp. Sec. Lt. (temp. Lt.) H. C., S. Staff R.; Murray, Lt. (temp. Capt.) K. D. P. (Spec. Res.); Murray, Lt. (temp. Capt.) R. G. H., M.C., Ind. Army.

Norris, temp. Sec. Lt. L. A., R.E.; Norton, temp. Lt. J. H., Gen. List.

Parker, Capt. G. A., D.S.O., M.C., Northn. R.; Parr, Lt. (temp. Capt.) A. W. C. V., Rif. Brig.; Pillers, Lt. (temp. Capt.) R. K., Northn. R.; Powell, Lt. (temp. Capt.) E. (Spec. Res.).

Reed, Sec. Lt. (temp. Lt.) W. E., R.E.; Routley, Sec. Lt. P. C., Welsh R.; Roxby, Capt. (temp. Maj.) F. M., N. Staff R. Shephard, Bt. Maj. (temp. Brig.-Gen.) G. S., M.C., R. Fus.; Shirley, Sec. Lt. (temp. Capt.) F. L. J., York R.; Stephenson, temp. Lt. R., Gen. List; Summers, temp. Capt. J. K., Gen. List.

Tasker, Sec. Lt. W. T. B. (Spec. Res.); Thompson, temp. Sec. Lt. J. W. R., Gen. List; Tucker, Lt. (temp. Capt.) C. G. (Spec. Res.).

Vaisey, Sec. Lt. C. T. H. (Spec. Res.) (died of wounds); Vincent, Lt. (temp. Capt.) S. F. (Spec. Res.).

Whitlock, Lt. (temp. Maj.) A. T. (Spec. Res.); Williams, temp. Lt. E. L.; Winter, Lt. (temp. Capt.) T. W. (Spec. Res.); Wise, Capt. (temp. Lt.-Col.) P. K., R. War R.

Young, Sec. Lt. F. C. (Spec. Res.) (killed).

Adams, No. 15723 Cpl. A. E.; Allen, No. 1674 Flt. Sgt. (actg. Sgt.-Maj.) W. J.; Barnes, No. 14299 Sgt. W. McC.; Bates, No. 274 Flt. Sgt. (actg. Sgt.-Maj.) G.; Beardsell, No. 1667 Flt. Sgt. A. E.; Bellairs, No. 2220 Flt. Sgt. J.; Black, No. 1894 Flt. Sgt. D.; Blake, No. 24107 Flt. Sgt. G. G. L.; Brown, No. 7969 Qr.-Mr.-Sgt. W. J.; Butt, No. 91 Flt. Sgt. (actg. Sgt.-Maj.) W. H.; Bywater, No. 3581 Cpl. R.; Camfield, No. 3804 Flt. Sgt. J. F.; Collins, No. 16320 Cpl. T.; Cottingham, No. 3232 Cpl. H. E.; Cryer, No. 3835 Flt. Sgt. S. E.; Davies, No. 26178 Flt. Sgt. D.; Davin, No. 61912 Sec. Cl. Air Mech. F. G.; Dawson, No. 15896 Flt. Sgt. J. D.; Farrow, No. 5403 Flt. Sgt. S.; Felton, No. 15917 Flt. Sgt. B. W.; Fitzgerald, No. 1705 Flt. Sgt. (actg. Sgt.-Maj.) M. B.; Freed, No. 4108 Sgt. A. H.; Gee, No. 1187 Flt. Sgt. A. H.; Gibson, No. 5098 Flt. Sgt. W. S.; Harries, No. 1334 Flt. Sgt. G. B.; Henderson, No. 15888 Sgt.-J.; James, No. 20236 Flt. Sgt. C. W.; Jenkins, No. 7521 Cpl. W. A.; Jones, No. 9399 Cpl. M.; Lawrie, No. 3702 Flt. Sgt. J. A.; Lowe, No. 32257 1st Cl. Air Mech. H. E.; Nethy, No. 104 Flt. Sgt. (actg. Staff Sgt.-Maj.) A. F.; Payne, No. 17062 Flt. Sgt. (actg. Sgt.-Maj.) H. J.; Perrin, No. 13091 Flt. Sgt. C. H.; Pinder, No. 11597 Sgt. W. J.; Rogers, No. 18319 Sgt. S. C.; Ross, No. 8254 1st Cl. Air Mech. J.; Rossi, No. 17122 Sgt. B. P.; Sanders, No. 6300 Flt. Sgt. E.; Sharpe, No. 5127 Flt. Sgt. (actg. Sgt.-Maj.) W. T.; Simpson, No. 436 Flt. Sgt. (actg. Sgt.-Maj.) A. H.; Skeggs, No. 2706 Flt. Sgt. (actg. Sgt.-Maj.) A. W.; Smallbones, No. 9572 Cpl. A.; Starling, No. 12377 Sgt. H. S.; Stevenson, No. 4003 Flt. Sgt. T.; Stone, No. 2048 Flt. Sgt. F.; Taylor, No. 12268 Cpl. R.; Turner, No. 128 Flt. Sgt. (actg. Sgt.-Maj.) W. G.; Webber, No. 2359 Flt. Sgt. W.

WAR OFFICE, May 16th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Equipment Officers, 2nd Cl.—Lt. (temp. Capt.) A. Heywood, Spec. Res., reverts from 1st Cl., and relinquishes his temp. rank, April 30th.

* * *

WAR OFFICE, May 17th.

REGULAR FORCES.—STAFF.—Staff Lt., Sec. Cl.—Sec. Lt. E. H. Wilding, R.F.C., Spec. Res., from an Equipment Officer, 3rd Cl., April 30th.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Equip. Officers, 1st Cl.—Lt. G. Somers-Clarke, Spec. Res., from the 2nd Cl., and to be temp. Capt. whilst so employed, April 28th.

MEMORANDUM.—Sgt.-Maj. W. W. Gibson, from R.F.C., to be temp. Sec. Lt. for duty with the Mil. Wing of that Corps, May 4th.

* * *

WAR OFFICE, May 18th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Flt. Comdrs.—From Flying Officer, and to be temp. Cpts. whilst so empld.:—Lt. I. M. Matheson, Sea. Highrs., Spec. Res., Dec. 2nd, 1916. Sec. Lt. W. E. L. Seward, Spec. Res., May 2nd. From Flying Officers:—Capt. G. H. B. McCall, Spec. Res., May 2nd. Temp. Lt. P. J. V. Lavarack, Gen. List, and to be temp. Capt. whilst so empld., May 4th.

Equipment Officers, 1st Cl.—From the 2nd Cl.—Sec. Lt. (temp. Capt.) N. M. Halcombe, R.E., T.F., and to retain his temp. rank whilst so empld., Feb. 3rd. Qr.-Mr. and Hon. Maj. J. Liddle, T.F. Res., and to be temp. Capt. whilst so empld. March 27th.

* * *

WAR OFFICE, May 19th.

SPECIAL RESERVE OF OFFICERS.—SUPPLEMENTARY TO REGULAR CORPS.—R.F.C.—MIL. WING.—Sec. Lts. to be Lts.:—(Temp. Lt.-Col.) C. H. Whittington, April 10th. (Temp. Maj.) C. Jarrott, April 18th.

Lts. to be Cpts.:—(Temp. Lt.-Col.) C. H. Whittington; (temp. Maj.) C. Jarrott, April 20th.

* * *

WAR OFFICE, May 21st.

REGULAR FORCES.—R.F.C.—SCHOOLS OF INSTR.—SCHOOLS OF MIL. AERONAUTICS.—Insp. of Technical Training.—(Graded

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as a Park Comdr.)—Temp. Capt. L. Sadler, A.S.C., an Eqpt. Officer, 1st Cl., and to be temp. Maj. while so empled., vice temp. Maj. A. E. G. MacCallum, Gen. List, April 10th.

WIRELESS AND OBSERVERS' SCHOOL.—Comdt.—(Graded as a Wing Comdr.)—Capt. (temp. Maj.) J. A. Chamier, D.S.O., Ind. Army, a Sqdn. Comdr., and to be temp. Lt.-Col. while so empled., April 29th.

Asst. Comdt.—Lt. (temp. Maj.) H. A. Oxenham, M.C., Spec. Res., to retain his present grading as a Park Comdr., and temp. rank of Maj. while so empled., April 29th.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign. The King has given unrestricted permission in all cases to wear the Decorations and Medals in question:—

Presented by the President of the French Republic.

CROIX DE GUERRE.

Capt. R. H. Freeman, M.C., Worc. R., S.R., and R.F.C.

156 Flt. Sgt. E. A. Gibbs, R.F.C.

MEDAILLE MILITAIRE.

1726 Flt. Sgt. D. P. Calder.

NAVAL.

The following appointments have been made in the Royal Naval Air Service:—

May 15th.—Temp. comms., R.N.V.R., have been granted to the following, seny. as follows, and all appointed to "President," for R.N.A.S.:—Lts. C. Harris, D. C. Swan, E. I. Sycamore, and C. Heath, all May 14th.

May 17th.—Lt. Comdr. (R.N.V.R.)—F. W. Belt, promoted to Actg. Comdr. (temp.), seny., May 15th.

Lt. (temp., R.N.V.R.)—W. F. Watson, transferred to R.N.A.S., May 16th.

Assist. Paymaster (R.N.)—W. S. Magrath, graded as Proby. Flt. Lt., seny., May 21st.

May 21st.—Lt.-Comdr. (R.N.R.)—O. H. K. Maguire (retd.), apptd. Actg. Comdr., seny. May 18th.

Wt. Officer (temp., 2nd Gde.)—H. H. Stone, granted a temp. commn. as Lt. (R.N.V.R.), seny. May 17th.

ADMIRALTY COMMUNIQUÉS.

May 18th.—From reports received from the Rear-Admiral Commanding British Adriatic Squadron, supplemented by an Italian communiqué issued to the Press, it appears that early on the morning of the 15th inst. an Austrian force consisting of light cruisers, which were subsequently reinforced by destroyers, raided the Allied drifter line in the Adriatic and succeeded in sinking 14 British drifters.

Italian aviators, after a battle in the air, attacked the Austrian warships outside Cattaro, and they confidently assert that one of the enemy cruisers was heavily on fire, and was being taken in tow off Cattaro in a sinking condition. One other enemy cruiser is reported by the British Admiral as being "badly damaged."

THE CASUALTY LIST.

MISSING.—Eppstein, Flt. Sub-Lt. Maurice	Reported May 16th.
	W. W., R.N.
MISSING.—Avery, Flt. Sub-Lt. George G.,	Reported May 18th.
	R.N.
PREVIOUSLY REPORTED MISSING, NOW	Reported May 19th.
Weil, Flt. Sub-Lt. L. M. B., R.N.	REPORTED KILLED.—
MISSING.—Walker, Flt. Sub-Lt. W. R., R.N.	
	Reported May 21st.
WOUNDED.—Magor, Flt. Sub-Lt. G. A., R.N.	
PREVIOUSLY REPORTED MISSING, NOW	REPORTED KILLED.—
Malone, Flt. Sub-Lt. J. J., R.N.	
PREVIOUSLY REPORTED MISSING (BELIEVED KILLED), NOW UN-	
OFFICIALLY REPORTED A PRISONER.—Slater, Flt. Sub-Lt. R. K.,	
R.N.	
	Reported May 22nd.
DROWNED.—Beckett, F., Aircraftmn. 2nd Grade, F.19245.	

PERSONAL NOTICES.

DEATHS.

MORGAN.—Flt. Lt. Lewis Morgan, R.N., whose death through an aeroplane accident was announced on May 11th, was the second and only surviving son of Capt. and Mrs. L. H. G. Morgan, of Cheddington, near Taunton. He was educated on His Majesty's ship, "Conway," and obtained his commission in the Royal Naval Reserve in 1908. On the outbreak of war he was appointed to the "Coronid," and served for nine months on the North Atlantic Station. Subsequently, he was transferred to the R.N.A.S., and secured his pilot's certificate in June, 1915.

One of his brother officers at Chingford, near which place the accident occurred, writes: "He was the most individual and the most cheerful soul in the place, and he was everyone's favourite, without ever parting with his own convictions or seeking popularity. He was always natural and frank, and I have often said that if I had to ask someone in the place to do me a good turn I should ask him. He was, moreover, an eminently skilful and

cool pilot; he has made a good many flights I should have been proud of, especially when he was on active service in German East Africa. He made a splendid instructor, because, with all his enterprise, he was more careful of his pupils learning to fly straightforwardly and without taking unnecessary risks than any other instructor I have known. His loss leaves a gap we shall all find it very difficult to fill, and none of us will ever forget him." His brothers, Capt. and Adjutant F. Morgan, R.F.A., 29th Division, and Lieut. W. B. Morgan, South Lancashire Regiment, both lost their lives in Gallipoli.

TITCOMB.—Prob. Flt. Officer Francis Holt Yates Titcomb, R.N., who was killed on April 15th while making a cross-country flight in England, was born at St. Ives, Cornwall, in 1898. He was the only son of Mr. and Mrs. W. H. Y. Titcomb, of Clifton, Bristol, and grandson of the late Bishop Titcomb, first Bishop of Rangoon, Burma. He received his early education in the Königliches Hohenzollern Gymnasium at Düsseldorf. He had a distinguished career at Clifton College, and won a Scholarship in Natural Science at Corpus College, Cambridge. It was his intention from boyhood to devote himself to research work in aviation.

WALTER.—Flt. Sub-Lt. Eric B. J. Walter, R.N., who was killed on April 24th, aged 19, was the elder son of Lt. Walter J. Walter, R.N.V.R., of the Stock Exchange, and late of Chase Cross, Romford, and Bryanston Street, W.C. He was educated at Stubbington, and University College School, and joined the R.N.A.S. on attaining his 18th birthday.

ENGAGEMENT.

ARNOLD—FREWER.—The marriage between Flt. Lt. Harold Arnold, D.S.O., and Dorothy, daughter of the Rev. Canon and Mrs. G. E. Frewer, of Beaconsfield, Furze Hill, Hove, Sussex, will take place quietly next month.

It was reported by the "Morning Post" correspondent from the Strunia Front on May 16th that two of the most successful bombing raids by naval aviators were made during the day, hardly a bomb missing its mark. A herd of cattle at an enemy supply dump was stamped all over the plain by a projectile dropped in the middle of them.

MILITARY

G.H.Q. COMMUNIQUÉS.

May 15th, 9.20 p.m.—Two German aeroplanes were brought down in air fighting yesterday, and one other hostile machine was driven down out of control. Two of our aeroplanes are missing.

May 16th, 9.50 p.m.—One German aeroplane was driven down out of control yesterday.

One of our machines is missing.

May 19th, 9.3 p.m.—One German aeroplane was brought down in air fighting yesterday, and another was shot down by gunfire from the ground. Two hostile observation balloons were also destroyed.

Five of our aeroplanes are missing.

May 20th, 9.12 p.m.—Three German aeroplanes were brought down yesterday in air fighting, one of which landed in our lines. Five other hostile machines were driven down out of control, and one German observation balloon was destroyed.

Four of our aeroplanes are missing.

MAY 21ST, 9.12 p.m.—There was great activity in the air yesterday. A number of successful bombing raids were carried out, and our aeroplanes co-operated actively with our infantry in their attacks, engaging German troops in the enemy's front line trenches with machine-gun fire.

In air fighting seven German aeroplanes were brought down, one of which fell in our lines, and eight others were driven down out of control.

Another hostile machine was shot down out of control by our anti-aircraft guns.

Four of our aeroplanes are missing.

* * *

WAR OFFICE COMMUNIQUÉS.

The G.O.C. British Forces in Macedonia reports:—May 16th.—The Royal Naval Air Service has carried out two successful bombing raids on the camps in rear of the enemy's line.

The G.O.C. British Forces in Macedonia reports:—May 19th.—The Royal Naval Air Service have successfully bombed the aerodrome and camp at Drama.

THE CASUALTY LIST.

MISSING.—McKissoch, Sec. Lt. C. W., R.F.C.	Reported May 15th.
Wood, Sec. Lt. G., R.F.C.	
	Reported May 17th.
KILLED.—Owen, Sec. Lt. I. ap R., R.F.C.	
Weeks, Sec. Lt. R. P. O., R.F.C.	
WOUNDED.—Eccles, Sec. Lt. H. E. K., R.F.C.	
Ellis, Lt. H. E. O., M.C., R.E., attd. R.F.C.	
Leach, Lt. J. O., M.C., Middx. R., attd. R.F.C.	
Meintjes, Capt. H., R.F.C.	
MISSING.—Chaworth Musters, Sec. Lt. R. M., Leic. R., attd. R.F.C.	

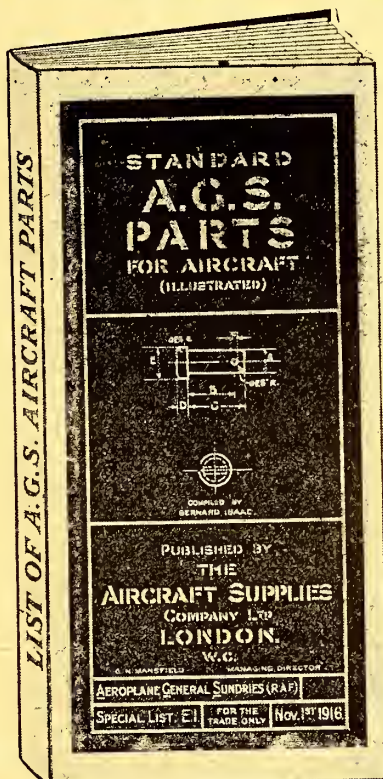
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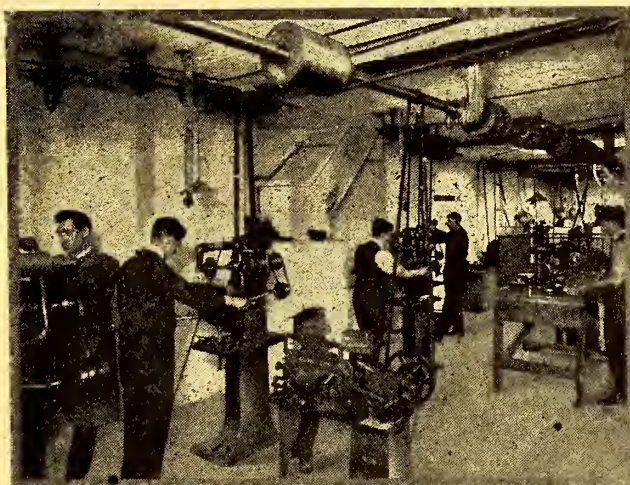
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Holmes, Lt. T. G., R.F.C.
 Kaizer, Sec. Lt. M. M., R.F.C.
 Nixon, Capt. W. E., K.O.S.B., attd. R.F.C.

Reported May 18th.

WOUNDED.—Leete, Capt. W. W., Ches. R. and R.F.C.
 Leishman, Sec. Lt. D., R.F.C.
 MISSING.—Ball, Capt. A., D.S.O., M.C., Sher. For. and R.F.C.
 Gaskian, Sec. Lt. C. S., R.F.A. and R.F.C.
 Gaultier, Lt. C. V., R. Lanc. R., attd. R.F.C.
 Jackson, Sec. Lt. G. W., North'd Fus. and R.F.C.
 Martin, Lt. A. W., York R. and R.F.C.
 CANADIAN CONTINGENT.—KILLED.—Davies, Lt. W. E., Alberta R., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—
 Campbell, Lt. W. A., B.C. Regt., attd. R.F.C.
 WOUNDED.—Dickson, Lt. J. L., Cent. Ont. R., attd. R.F.C.
 McConkey, Lt. T. W., Manitoba R., attd. R.F.C.
 Wilson, Lt. B. A., Manitoba R., attd. R.F.C.
 MISSING.—Harvey, Lt. J. B., Cent. Ont. R., attd. R.F.C.
 Wickett, Lt. T. H., W. Ont. R., attd. R.F.C.

Reported May 19th.

KILLED.—Day, Sec. Lt. J. C., R. Suss. R., attd. R.F.C.
 ACCIDENTALLY KILLED.—Ham, Sec. Lt. F. W., R.F.C.
 WOUNDED.—Balfour, Capt. H. H., K.R.R.C., attd. R.F.C.
 Cruickshank, Sec. Lt. E. A. W., R.F.C.
 Douglas, Maj. W. S., M.C., R.F.A. and R.F.C.
 Price, Sec. Lt. W. T., R. War. R., attd. R.F.C.
 Rowe, Lt. W. C., Oxf. and Bucks. L.I., attd. R.F.C.
 Stubbs, Sec. Lt. J. S., S. Lanc. R., attd. R.F.C.
 Wilkinson, Sec. Lt. H. R., R.F.C.
 MISSING.—Furlonger, Sec. Lt. C. A. M., R.F.C.
 Lane, Sec. Lt. C. W., K.R.R.C., attd. R.F.C.
 Mills, Lt. W. L., R.F.A., attd. R.F.C.
 Woolliams, Sec. Lt. F. H., R.F.C.
 KILLED.—PREVIOUSLY MISSING, NOW REPORTED KILLED.—R.F.C.—
 Walker, 2260 Sgt. A.
 DIED AS PRISONERS IN TURKISH HANDS.—PREVIOUSLY MISSING,
 NOW REPORTED DIED AS PRISONERS IN TURKISH HANDS.—
 R.F.C.—Wells, 7870 2nd Cl. Air Mech. S. J.
 Webb, 4477 Sgt. A.

Reported May 21st.

KILLED.—Butterworth, Sec. Lt. N., Manch. R. and R.F.C.
 Cutler, Lt. H. C., Yeo. and R.F.C.
 Mason, Sec. Lt. A. W., R.F.C.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED, NOW REPORTED
 KILLED.—Glasson, Sec. Lt. D. H., R.F.C.

WOUNDED.—Clay, Lt. C. G., Sher. For. and R.F.C.
 Deane, Capt. E. W., N. Staff. R., attd. R.F.C.
 Eycott-Martin, Sec. Lt. H. R., R.E., attd. R.F.C.
 Hawksley, Sec. Lt. G. E., R.F.A., attd. R.F.C.
 Learmount, Maj. L. W., M.C., R.F.C.
 Magenais, Sec. Lt. F. M., R.F.C.
 McQuiston, Sec. Lt. F., R.F.A. and R.F.C.
 Mercer, Sec. Lt. W. K., Gord. Highrs. and R.F.C.
 Pemberton, Capt. F. D., R.F.A., attd. R.F.C.

MISSING.—Cull, Capt. A. T., Sea. Highrs., attd. R.F.C.
 Darker, Sec. Lt. N. O., R. Scots.
 Duxbury, Sec. Lt. H. C., R.F.C.
 Holroyde, Sec. Lt. J. S., E. Yorks R., attd. R.F.C.
 Moore, Sec. Lt. E. S., R.F.C.
 Pitt, Sec. Lt. B. W., R.F.C.
 Sheehan, Sec. Lt. D. J., R.F.C.
 Webb, Sec. Lt. T., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN

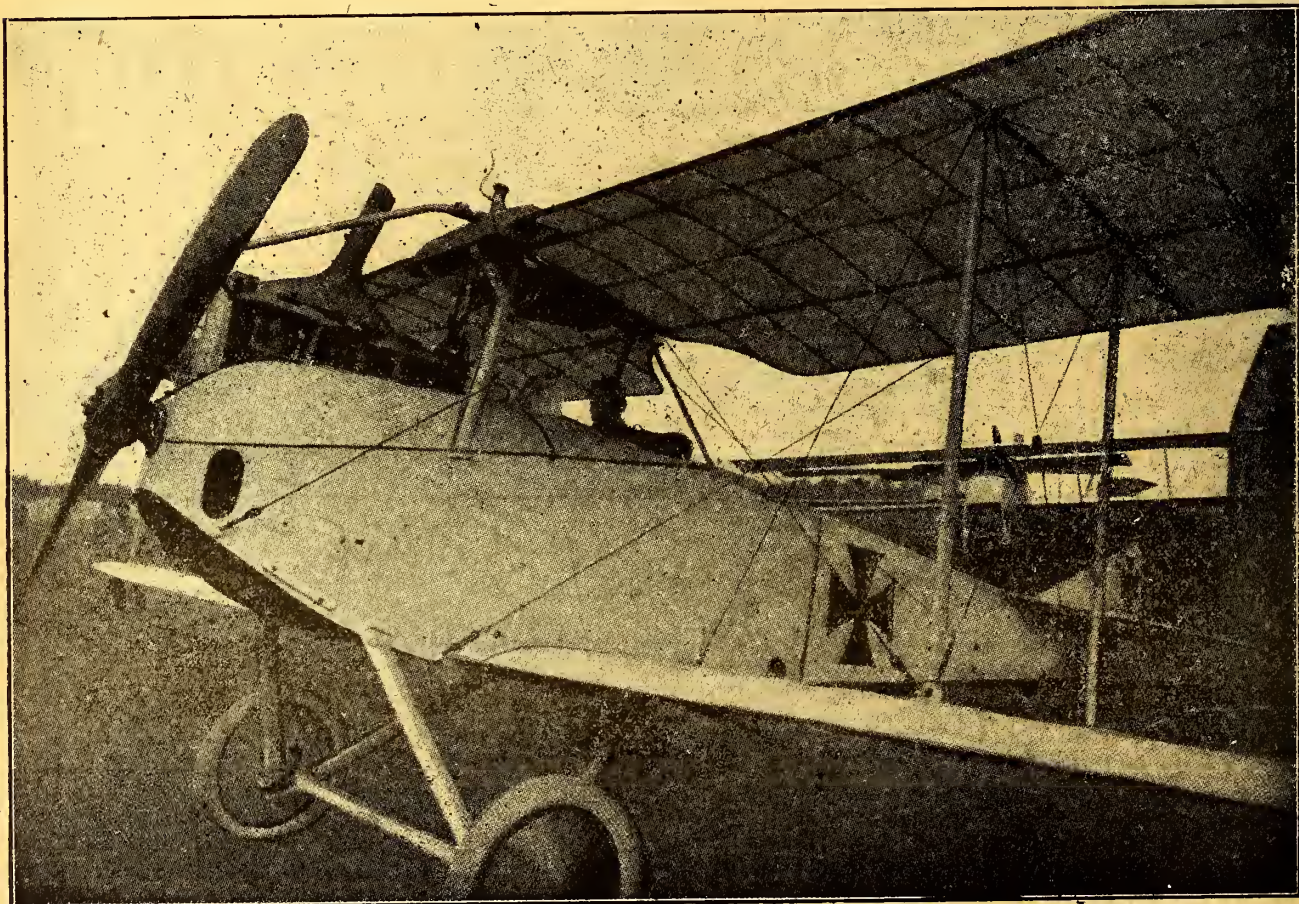
GERMAN HANDS.—Anderson, Lt. W., M.C., R.F.C.
 Bennett, Sec. Lt. C. D., R.F.C.
 Birch, Sec. Lt. D. C., North'n R., attd. R.F.C.
 Bousfield, Lt. J. K., M.C., R.E., attd. R.F.C.
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 Gilbert, Lt. C. G., R.F.C.
 Lewis, Lt. M., R.F.C.
 Logan, Capt. R. A., R.F.C.
 McKerrell, Lt. A. D., K.O.S.B.
 Rowland, Sec. Lt. T., R. Welsh Fus.
 Sharpe, Sec. Lt. S. A., R.F.A., attd. R.F.C.
 Warren, Lt. A. P., R.F.C.
 Whitehead, Lt. A. D., R. War. R., attd. R.F.C.

CANADIAN CONTINGENT.—WOUNDED.—Alder, Lt. E., Manitoba,
 attd. R.F.C.

Reported May 22nd.

PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF
 WOUNDS.—Westlake, Sec. Lt. J. H., R.F.C.
 ACCIDENTALLY KILLED.—Robertson, Sec. Lt. R., Hamp. R. and
 R.F.C.

(Continued on page 1334)



The bow of an L.V.G. Biplane, Type D.9. A very workmanlike job. Note the radiator built into the centre section of the upper plane, with the gravity petrol tank behind.

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The British Aircraft Industry.

BY CHARLES L. FREESTON.

(Founder Member of the Royal Aero Club.)

XVII.—PORTHOLME AERODROME, LTD.

In the mechanical world I have never met a man more versatile than Mr. James Radley, the founder of Portholme Aerodrome, Ltd. of Huntingdon; indeed, to this day, though I have known him intimately for ten years or more, I am in doubt whether to regard him as primarily a first-class pilot, an aeroplane constructor, a motor engineer, a superb driver, or a naval expert. He himself says that he is above everything a sailor, and is more interested in submarines than in anything else in the world; but in respect of either air or land he has shown himself so adept that no one would imagine that he was destined for any other rôle than the one he happened at the moment to have in hand.

SOME ALPINE EXPLOITS.

Physically, however, he is certainly a born flier, being possessed of a most superabundant vitality and resource, of which I happen to have had numerous opportunities of observing in a different milieu.

In the year 1908 I travelled with him by road through France and Italy, and shall never forget the way in which, among Alpine altitudes, he would drive without either coat or waistcoat, his shirt-sleeves rolled up to his shoulders, and his chest open to every wind that blew, in temperatures that made me button up my heavy driving coat.

Then, again, in 1912, 1913, and 1914, he was a competitor in the Austrian Alpine Trials, each of which I followed throughout as a free lance, and though the daily journeys were mostly of 250 miles or more, crossing, perhaps, six passes in a day of 6,000 to 7,000 ft., he seemed utterly independent of food, drink, or sleep, and would even drive all night to inspect the next day's run. For the 1914 contest he left Derby on his Rolls-Royce and reached Paris the same evening, was in Turin on the following day, and in Vienna on the third, while his drive from London to Monte Carlo, on which he beat the train, is memorable as the most strenuous performance in motoring annals.

ALWAYS ON THE MOVE

Business cares, notwithstanding, he was likely at any moment—before the war—to jump on to his car and set off for Naples, where he spent his boyhood, or to any other distant spot which it was his fancy to visit, and he has crossed the Mont Cenis Pass 27 times, and driven over 240,000 miles of continental roads.

His driving in the last Alpine Trial simply electrified the Austrians, and every day he ran the pilot cars off their legs, though the officials travelled on relays of 28-90-h.p. Austro-Daimlers, and he sailed by the 100-h.p. Benz and other big-engined cars which had priority at the start. But his mechanical knowledge was no less a thing to wonder at, and by various fittings of his own devising he made his Rolls-Royce several miles an hour faster than the sister car which I was driving, and which otherwise

would have seemed the last word in accelerative and pass-climbing powers.

WHAT MIGHT HAVE BEEN.

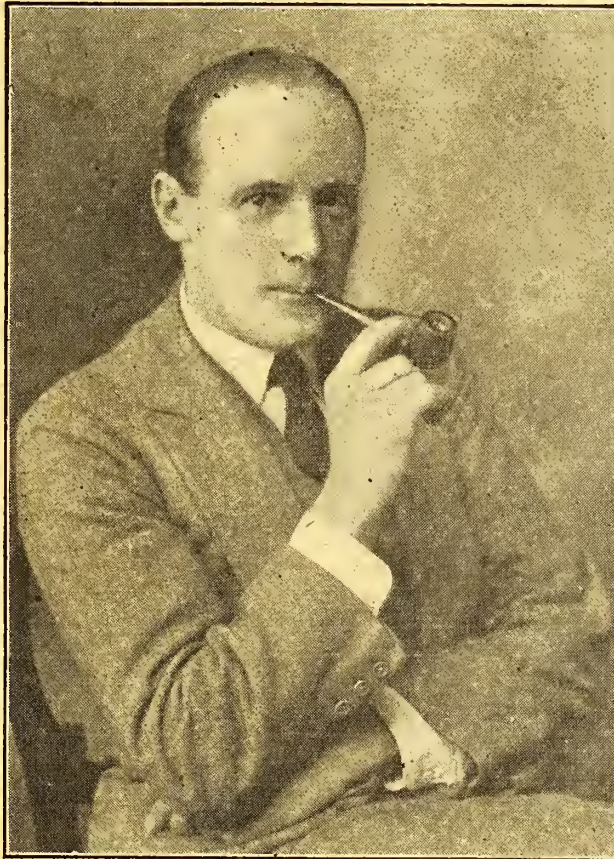
Had this combination of irrepressible energy with mechanical skill been devoted exclusively to aviation, and backed by adequate capital, Mr. Radley would have been ere now a very considerable power in the aircraft industry. He has never wholly lost touch with motor engineering, however, while the vicissitudes of the pre-war era, in the absence of official encouragement, led him to abandon his ideal of becoming a permanent specialist in aeroplane design. None the less, he has been a very prominent figure at times in the world of flight, particularly in 1910-11, and is to be numbered with the select band of the earliest cross-Channel pilots.

A VARIED TRAINING.

His early training, it may be mentioned, was comprehensive and thorough. He served his apprenticeship with W. H. Allen, Son and Co. at Bedford, during the South African War, and afterwards went for a time to Germany. Then he went north and spent some time with Neilson, Reid and Co., of Glasgow, whose locomotive works are the largest in the world, and he also gained experience in various shipbuilding and engineering yards, eventually qualifying as a certified marine engineer. He then started an engineering works of his own in the Midlands, and ran this for four years. Then he went to Canada, and did a considerable amount of surveying work for the Canadian Pacific Railway, and also drove a threshing machine during a harvest season in North Dakota.

A BOLD EFFORT.

In February, 1910, he sold his motor-car and bought a Blériot monoplane in Paris, although he had never seen a machine in the air, and knew nothing about flying. When he got it to England he took the machine out of the crate at the railway siding and



Mr. James Radley.

completed the task of erection quite unaided. As he had only £20 left, his flying career depended upon getting the machine off the ground and flying it properly at the first attempt.

This he succeeded in accomplishing. He got the machine up straight away, and flew it for a mile across the ground at Portholme, Huntingdon, and contrived to do one half turn. On the second day he made two complete turns, and three days later he flew continuously for twenty minutes, making seventeen circuits over the ground.

A NATURAL AERODROME.

The Portholme Meadow was peculiarly well adapted to an initial venture of this kind. It is the largest meadow in England, and within its 390 acres a three-miles circuit is possible; it is so flat, moreover, that when the Ouse rises two or three inches, the whole meadow is immediately submerged. With so advantageous a practice ground, and his own natural aptitude, Mr. Radley made further and rapid progress, and soon put up a flight of 21 miles without alighting.

Then he obtained his first engagement, at a fee of £100, to fly at some festival at Abergele, and this was followed by various small exhibition flights elsewhere.

FLIGHTS AT BROOKLANDS.

Major Lindsay Lloyd then offered the use of a shed and other inducements at Brooklands, and Mr. Radley moved thither with two machines, having acquired a second Blériot out of the proceeds of his exhibition flights. Up to then he had never been near an aerodrome, and had, therefore, had no opportunity of obtaining his pilot's brevet, but as soon as he arrived at Brooklands he went up and qualified, and secured ticket No. 12 on the Royal Aero Club list. As he had actually taught himself to fly four months earlier he may claim an honourable place among British pioneer pilots.

A BRITISH SPEED RECORD.

Competing at the various provincial flying meetings of that year, Mr. Radley won a few pounds in prizes at Wolverhampton, but at Bournemouth he was at the mercy of a "dud" engine, which never failed to seize on the third circuit every time he went up in the air. Forthwith, however, he ordered a new 50-h.p. Blériot after seeing Morane's successes on a machine of that type. The change was eminently justified, for at the Lanark meeting Mr. Radley put up a British speed record of 122 kilometres an hour, and won £1,200 in prizes.

THE GORDON-BENNETT RACE.

In September, 1910, Mr. Radley was chosen to represent this country, along with Mr. C. Grahame-White and Mr. A. Ogilvie, in the Gordon-Bennett Cup contest at Belmont Park, in America. The trophy was won, it may be remembered, by Mr. Grahame-White. Other meetings followed, and that of Baltimore proved memorable in more ways than one.

Mr. Radley erected his machine some miles away from the ground, and then flew across country and alighted on the aerodrome, being the first pilot to arrive with his machine *mise au point*. That night, however, there was a violent storm, which wrecked all the sheds. His machine was virtually smashed to ribbons, the engine being the only part left intact. No mechanics, or even materials, were available, but Mr. Radley rose to the occasion.

A SMART FEAT.

Hiring a small workshop, he addressed himself to the task of re-building the machine with his own hands. He made a new under-carriage, new fuselage, new tail and elevator, and one new wing. After working single-handed, night and day, for a whole week, he had the machine ready by the last day of the meeting, and earned his guarantee of 5,000 dollars.

By way of Denver Mr. Radley then went to San Francisco along with the late Hubert Latham, and engaged himself to fly at the Los Angeles and San Francisco meetings. In the meantime he made several cross country flights, one of which was from San José to Santa Cruz and across the Bay of Monterey to Delmonte, over 15 miles of water. He landed on the race-course at Delmonte, where he stayed for a fortnight giving exhibition flights. At Los Angeles he won prizes for speed, accurate landing and quick mounting, as well as others, which brought his aggregate winnings to £2,200.

OVER THE FLEET.

The San Francisco meeting followed. On the first day he flew from the aerodrome to the city, 14 miles away, circled round the bay and the lower end of the city, and then flew low over the American fleet, which was lying at anchor at the time. While he was doing this "stunt," Latham set off in the opposite direction, and the pair met in mid-air over the harbour. The people, of course, had never seen anything of the kind before, and were immensely impressed. As a result a crowd of over 200,000 turned up at the meeting of the Sunday following. The swarm, in fact, broke the barriers, and 100,000 of them paid nothing for admission.

In company with the famous American pilot Brookins, Mr. Radley flew from San Francisco to the Burlingham Country Club for luncheon. There was no landing place available except a golf green between the trees. The return journey was a light thing, as the machines had to get off the ground amid an environment of gum-trees, but, fortunately, escaped mishap.

CROSSING THE CHANNEL.

Returning to England in March, 1911, Mr. Radley took over the Huntingdon ground and formed a small company, under the name of the Portholme Aerodrome Co., of which he and the late Mr. W. B. Rhodes Moorhouse, of lamented memory, were the principals.

On August 25th Mr. Radley joined the select band of cross-Channel fliers. He had had no intention of crossing on the date in question, but on finishing up a flight at Calais, he found that there were so many people on the ground that he could not land, so he headed for England straightaway. A pretty strong north-east wind was blowing at the time, and he crossed to Dover, but did not elect to land there as he did not know the country.

The sun had set before he started from Calais, and by the time he reached Dover the pier lights were aglow. He headed for Folkestone, however, but when over Shorncliffe camp the motor stopped, and to this day Mr. Radley does not know whether he had switched it off or not, but is inclined to think that he did not. The crossing occupied 21 minutes, during which Mr. Radley saw absolutely nothing but Dover lighthouse and one four-masted barque.

THE BLÉRIOT AFLOAT.

The next day he lent the machine to Mr. (now Capt.) Oscar Morison for a flight round the Isle of Wight, but he had only risen 100 ft. above the cliffs when the engine stopped and the machine dropped into the sea. The incident provided the first opportunity of proving whether a Blériot would float or not, and, as a matter of fact, it kept above water for two hours, the pilot sitting quite comfortably right up to the time when he was towed to land. The only damage caused was during the actual dragging ashore, when the wings were broken.

A TRIPLE POWER UNIT.

Experimental work at Huntingdon was carried on for a couple of years, during which the company built various machines of more or less successful designs, but lost a good deal of money owing to the entire lack of official support. As Mr. G. F. Joseph, the able general manager, remarked to me a short time ago, "There was nothing to be got out of aeroplane building in those days, as there were no Government orders to be had, and private customers usually smashed themselves up."

Then Mr. Radley designed, in conjunction with Mr. Gordon England, the seaplane referred to in the previous article of this series. The idea, it may be added, of having a triple power unit was Mr. Radley's own, and to this day he is convinced of its merits. With the three 50-h.p. Gnome motors working he got over 70 m.p.h. out of the machine, and 60 m.p.h. with one motor cut out.

The underlying theory was that it was hardly likely that more than one motor would fail at a time, and in that condition it was capable of both flying and climbing, even though one motor was dragging. It was, undoubtedly, a thoroughly interesting machine, and its untimely end, owing to pure accident, was much to be deplored. The cost of building was £3,000, and when it broke up by fouling a buoy, Mr. Radley's total losses in respect of experimental work had amounted to £10,000.

WAR WORK.

Where aeroplane construction was concerned, therefore, the work of the Portholme Aerodrome Co. became very slack, though a body-building works for motor-cars was meanwhile carried on with success. When the war broke out, however, the past experience of the firm was at the country's disposal. In the first instance, they built some armoured cars for the R.N.A.S., and also built a crane, of Mr. Radley's own design, for extricating lorries from ditches at the front.

An order was then obtained from the Admiralty for the building of a number of Wight seaplanes, after which, owing to the kindness of Mr. T. O. M. Sopwith, the firm were entrusted with large contracts for Sopwith machines. The Portholme Aerodrome Co. pride themselves above everything else upon promptitude and keeping up to time, and invariably have their machines ready on the promised dates. There is another department of work, it may be added, of a very interesting character, upon which they are also engaged, but to which reference under present conditions may not be made.

Finally, it should be mentioned that the services which Mr. Joseph, who was formerly assistant secretary to the Royal Aero Club, has rendered to the firm since 1912 have been of the most loyal and invaluable kind.

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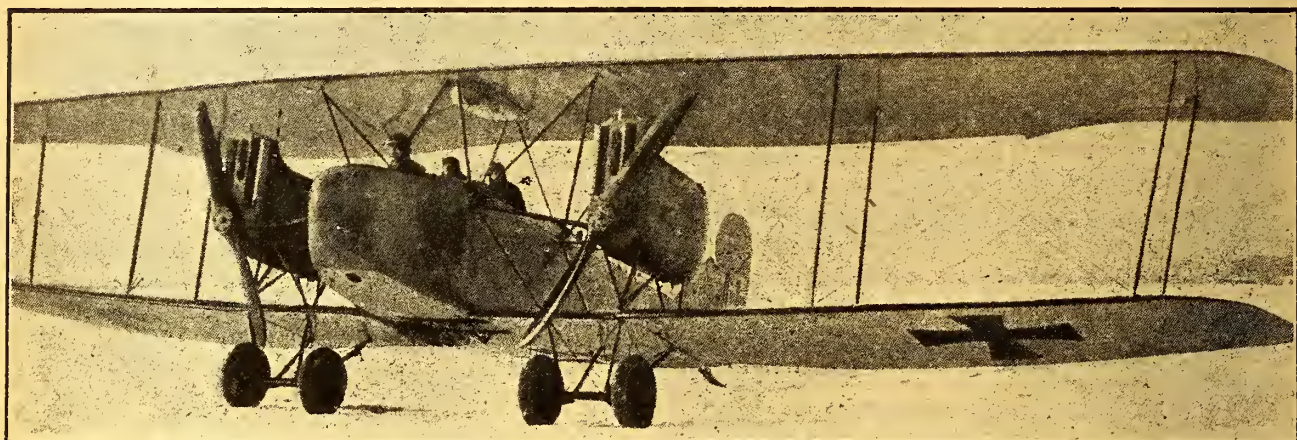
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SOME NEW GERMAN AEROPLANES.

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THE A.E.G. BIPLANE.—A twin-engined bomb-dropping machine.

The accompanying illustrations and information are compiled from various German sources, and the interesting pictures must make amends for the scarce specifications available, but themselves render chances of studying the latest development of German war aviation.

THE TWIN A.E.G.

One of Germany's most employed battleplanes is the A.E.G. twin-engined and three-seated tractor biplane of the aircraft department of the largest German concern: "Allgemeine Elektrizitäts Gesellschaft" (General Electric Co.). The motors are carried on a front four-struts pyramid, and a back set V of two struts without any support to the top plane, above the landing chassis consisting of two pairs of wheels, each carried by two V struts.

The cabane, consisting of three pairs of V struts, the front one forward being inclined forward. The bomb dropping device is below the passenger seats, and the big feeding tank in the upper plane is clearly visible.

The shape of the radiators and of the rudder are noteworthy.

THE L.V.G.

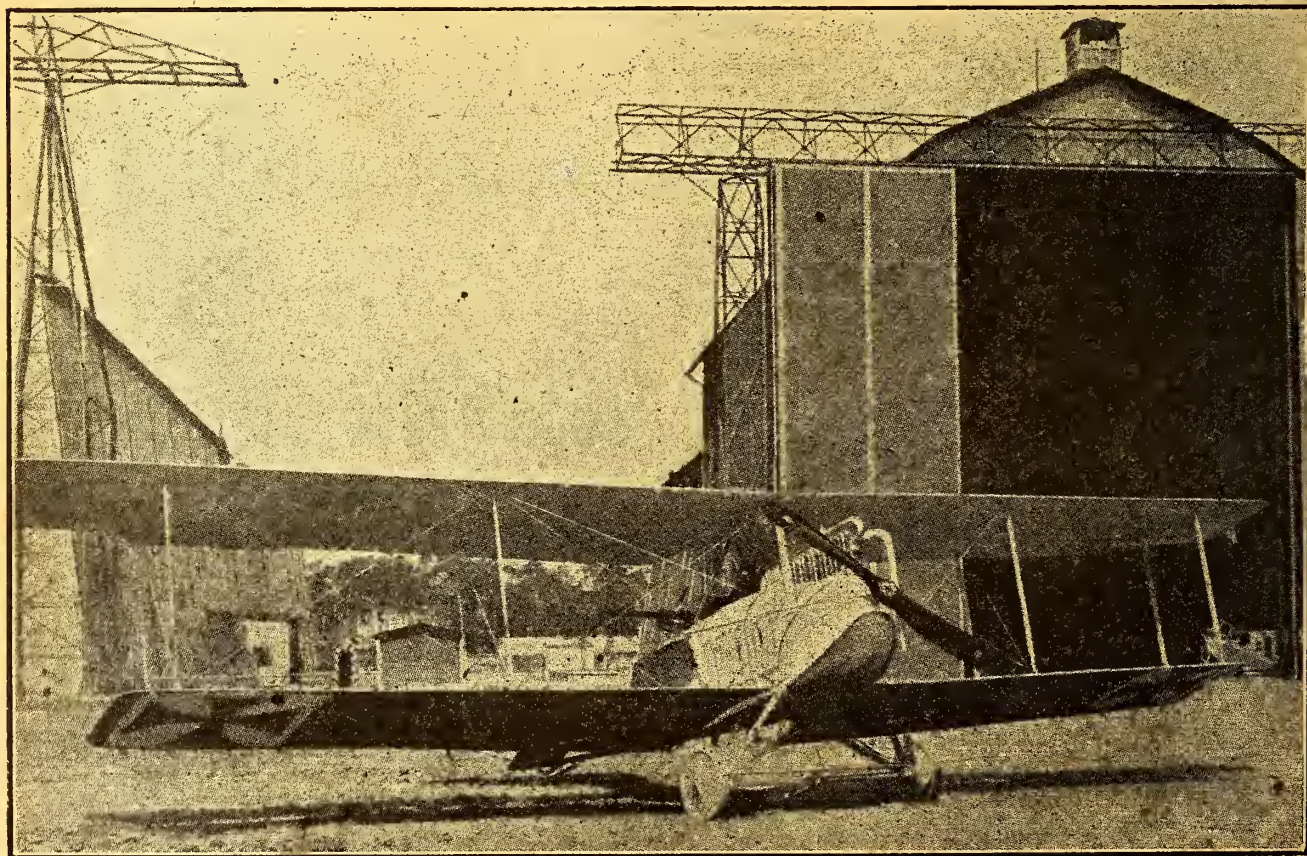
The L.V.G. biplane is of usual general appearance except that the feeding petrol tank has been transferred to the left, just below the upper plane, and its general place has been taken by the radiator, of plane shape, with a small water tank, built and working as a small stabilising fin.

THE ROLAND FIGHTER.

The Roland (illustrated last week) is a typical modern German scout, being the latest sort of two-seater with a direct strut influence of the Curtiss scouts. The thickness of the single wire cross indicates likely that the Germans streamline now, too, the two bracing cords with intermediate wood.

The Roland biplane possesses the typical "whale" characteristics of that type, which has, with the corresponding Albatros and Halberstadt models, been named the "German Spads."

The gun turret and the seat of the passenger is of the general type, the single window at the passenger's seat and the double one of the pilot's are clearly visible. The landing chassis is equipped with a claw brake. The engine is a 160-h.p. Mercédès



A MODERN L.V.G. BIPLANE, with 160-h.p. Benz motor.

Tubbs, Lewis & Co.

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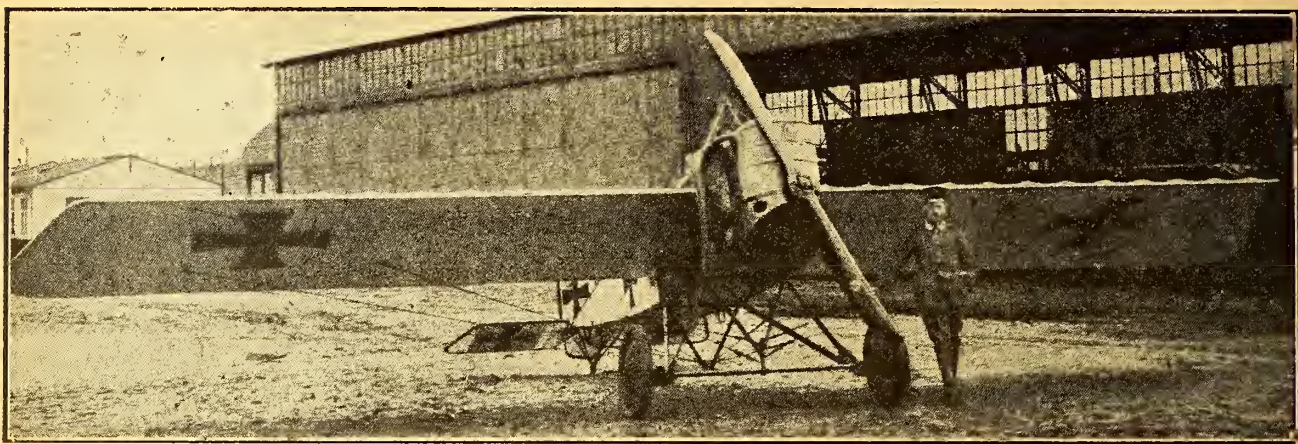
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THE PFALZ MONOPLANE.—This machine closely resembles the fixed engine Fokker.

motor, and the branched cooling tubes on the upper plane are noteworthy, though their object at much head resistance is not evident from the illustration.

THE PFALZ MONOPLANE.

The Morane type monoplane is a product of the Pfalz aircraft works in Speier on the Rhine, employing a 100-h.p. Mercédès stationary motor with a somewhat streamlined front elevation.

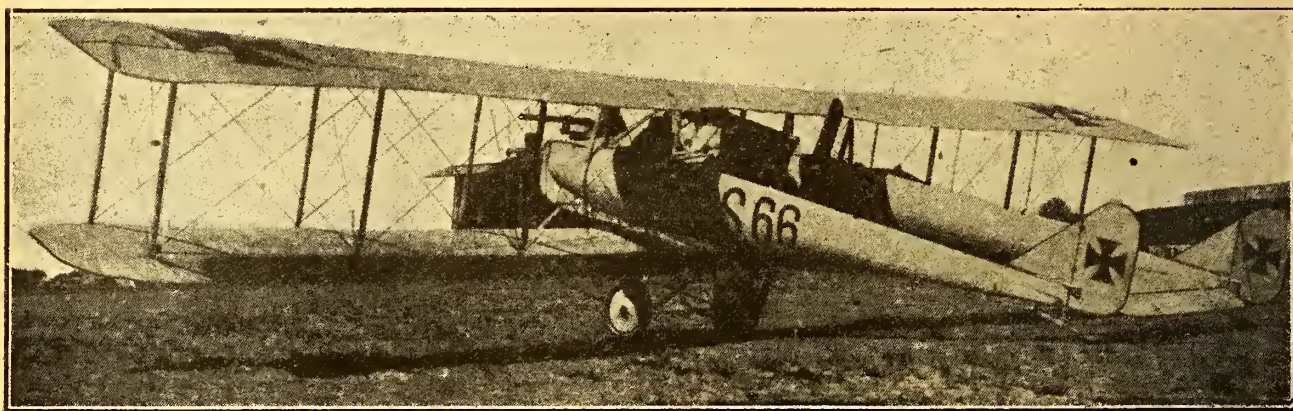
A Pfalz biplane, much like the Ago pusher with the Champel type nacelle, was used on German side in the East African campaign, and the Pfalz monoplanes, either with rotary or sta-

looks like the ventilator cowl usually seen on a Renault motor.

The seats of the pilot and his observer are evident in front of the planes, but it is not ascertainable whether there is a third seat at the back edge of the planes. The big petrol tank is visible in the upper plane.

THE AGO TWO-TAILS.

The twin-bodied pusher biplane marked S.66 is a product of the Ago works, which are managed by a lady director, Frau Woerner. The observer sits in front in the boat-shaped united nacelle of the bodies, managing the clear range gun. The single



"TWO-TAILS."—An Ago biplane with twin fuselages and a single pusher airscrew.

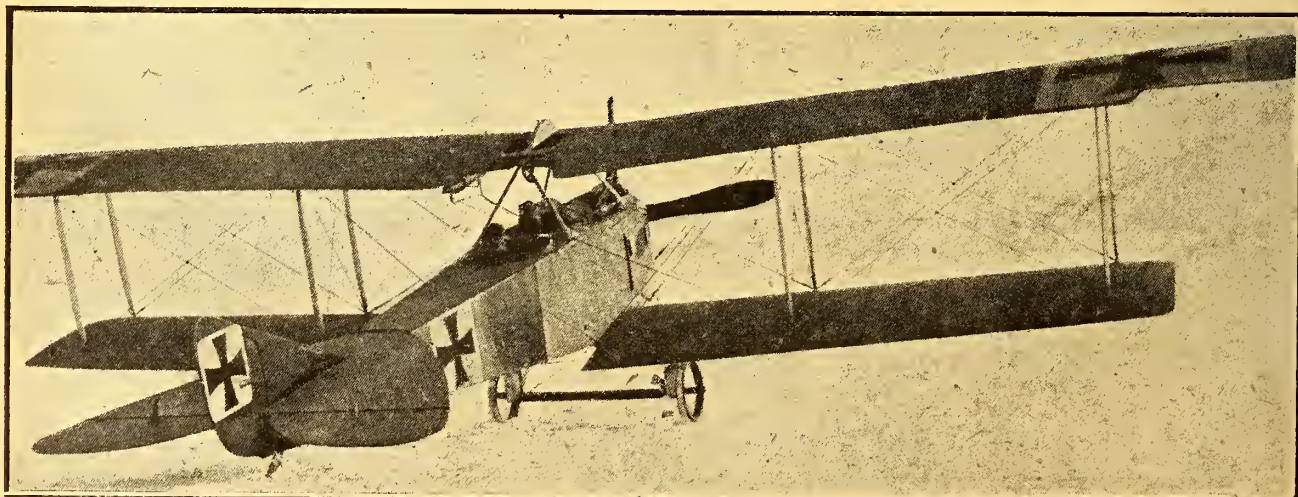
tionary engines, are very similar to the Fokker, from which they differ in their armament of two fixed guns, mounted on each side of the pilot and firing through the propeller.

THE GOTHA BIPLANE.

The illustration of the big, twin-engined Gotha biplane, printed elsewhere, was taken over the theatre of war from a higher flying aeroplane. The battleplane is a pusher, as indicated by the cutting of the planes, and the front part of the right engine

engine is a 150-h.p. Benz motor. The landing chassis is equipped with a claw brake and two skids, supported by struts from the front part of the nacelle.

The surroundings indicate that the picture was taken at the Johannisthal aerodrome, and with its Maurice Farman rudders this Ago biplane looks much like the one that artists produced about a year ago to general verbal description, as none were brought down, of a three-engined Aviatik aircraft.



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AIRCRAFT AND MOTOR-CAR ENGINE DESIGN.

Mr. LOUIS COATALEN's paper on Aero-Engines, which was of great length and of still greater interest, was reproduced in full in this paper last week. The discussion which took place thereon follows hereafter.

Owing to the indisposition of Dr. DOUGALD CLERK, Mr. HENRY FOWLER, Superintendent of the Royal Aircraft Factory, occupied the chair, and controlled the discussion with marked ability and tact. In introducing Mr. Coatalen, he referred to the excellent work he had done in designing and producing engines.

Mr. ROUTLEDGE, when called upon to speak, said that he agreed with practically everything Mr. Coatalen had said and did not desire to dispute any point in his argument.

The discussion was continued by a member of the audience whom, judging by the fact that he wore the uniform of a major in His Majesty's Territorial Force, one assumes to be an officer and gentleman, though, as Lt.-Col. Mervyn O'Gorman referred to him as "Mister" Green, possibly one was mistaken. One was credibly informed that the member in question was an ex-official of the Royal Aircraft Factory before the reorganisation (a fact somewhat confirmed by his manner and method of discussion), and that he is now engaged in instructing a motor-car firm in the delicate art of making aero-engines of Government design in such manner that they will function.

Major GREEN condescended to admit that he recognised that progress had been made in engines, but said he would have liked to have heard more about stresses and bearing-loads, but thought that perhaps fear of the authorities prevented Mr. Coatalen from publishing figures. One ventures to think that Mr. Coatalen is probably too wise to publish the figures obtained at his firm's expense for the benefit of official or semi-official competitors.

Major GREEN remarked that it was surprising what one could do by selecting a type of engine and sticking to it. One cordially agrees with Major Green. When one considers what has been done in the way of wasting time, labour, material, energy, aeroplanes, and lives by selecting the R.A.F. engine and sticking to it, one is more than surprised.

Major GREEN further remarked that it was surprising what a number of different types of engines are in use. Again one agrees. Considering the strenuous efforts which have been made to prevent new types of engines from being developed, and the efforts made to standardise on inferior engines of Government design, one is agreeably surprised that so many types have survived to serve so well our active-service pilots. One hopes one has comprehended aright Major Green's meaning.

Major GREEN continued by saying that he thought the rotary or Gnome type of engine the most unpromising, that he was glad to see the "six-cylinder-in-line" type getting lighter, that he did not see that it was better to have the sparking plug in the cylinder head than in the side of the cylinder, and that he did not see that a better shape of cylinder head was obtained with four valves than with two. On all of which points, excepting that regarding the six-in-line engine, one can only regret Major Green's seemingly warped view of aero-engines, and remark that if these views had been expressed by anyone who was not a Government expert one would have set them down to lack of knowledge of the elements of internal combustion engineering.

Major GREEN then informed the audience that the bulk of lubricating oil was now carried outside the base-chamber, not for cooling purposes, but because the oil, if in the base chamber, would run forward when the machine dived, and flood the forward cylinders. Possibly Major Green was right, so far as the brains of the Royal Aircraft Factory under its old management were concerned, but it occurs to one that any infant who has ever been disappointed in an effort to add to the joy of life by the perversity of a common or schoolroom unspillable ink-pot could have designed successfully an unspillable oil-sump.

Somehow his remarks remind one of a certain employé of the R.A.F. in the old days who was notable for his desire always to give good advice to other people. One day the late Mr. Cody flew over from Laffan's Plain to the R.A.F., and the officious official dashed out to assist in starting him on his return journey. Desiring to be well in the limelight he inserted himself between the tail booms and was going to start up the engine. Then there was a horrid pause, and, to the frantic joy of the hands watching the show, he was heard asking dear old rule-of-thumb Mr. Cody, "Which way round does the propeller go?"

Major GREEN further enlightened the audience on the subject of head-resistance of engines, remarking it is the custom to regard "in-line" engines as offering the least resistance, but he, personally, was of the opinion that if the engine does not stick out too much beyond the fuselage the resistance is small enough. One assumes that Major Green's ideas of streamlining were derived from contemplation of the assembling arrangement—one cannot, in justice to real aeroplanes, call it the design—of a B.E.2c, or later R.A.F. efforts. One recommends Mr. Green to study the streamlining of a D.I. type Albatros. He remarked that probably a cowled-in rotary engine gives as little head resistance as any.

Major GREEN terminated his entertaining dissertation by congratulating Mr. Coatalen on having designed so many experimental types of engines, and on having at the Sunbeam Co. directors who were so broadminded as to see him through. Some of the audience seemed to imagine that these remarks were a ponderous attempt at sarcastic humour of the essentially English kind, but one prefers to think that they represent the speaker's feelings from the bottom of his soul. None knows more about failures of experiments than an ex-employé of the R.A.F. And anyone who has been even remotely associated with the five-year struggle, and the invariable and uniform failure of the R.A.F. to achieve reasonable success with about three different and singularly unoriginal types of engines, and with unlimited money, machinery and labour at its disposal, must, if he possess a properly Christian spirit, feel very like congratulating a man who in a trifle over three years has produced between half a dozen and a dozen decidedly original engines, none of which have been failures, the worst of which have been better than the official best, and the best of which have done very good work indeed on active service under very difficult conditions.

The man whose experimental designs succeed, and who thereby makes a technical success which satisfies his own artistic soul and at the same time makes a commercial success which satisfies his directors, so that he is able to help his country, and also to keep his job, certainly deserves congratulations, and so do his directors.

The directors should be congratulated on their perspicuity in choosing their man, rather than on their pertinacity in seeing him through his experiments, for mere "seeing through" may indicate nothing better than obtuse obstinacy, or official fear of admitting failure by cutting losses. Which remarks apply equally to financial directors of private or public companies as to directors or deputy-directors or assistant directors of the material and other affairs of the Services.

The trouble is that though officials will always see their subordinates through an awkward predicament which might reflect back on their department, they so seldom see through their subordinates.

Mr. GROVER C. LOENING, of the American Sturtevant Company, who is in England on special technical work, admitted that American engines are not yet fully up to the European standard in every way. He agreed entirely with Mr. Coatalen's remarks that aircraft engines are a proposition quite different from motor-car engines. He made the very interesting suggestion that as the dry sump system of lubrication has been adopted it might be possible now to perfect the upside-down type of engine with which experiments were made with only moderate success some five or six years ago. The advantage of this system, as he pointed out, is that the weight of the cylinders is low down, and the propeller shaft is high up. Consequently, one gets a better arrangement of the centre of gravity and of the centre of thrust.

One desires to endorse heartily Mr. Loening's suggestion, if only as an experiment, for those who were concerned with aviation in its early days will recollect the promising behaviour of the Gyp engine, and although such an experienced firm as the Mercédès tried the idea of an upside-down engine and gave it up, it was probably forsaken because less was known about the subject of lubrication in those days than to-day.

Incidentally, the writer has recently come across a very interesting type of two-stroke engine peculiarly adapted for this arrangement, in that the explosion takes place while the piston is travelling outwards, so that the connecting-rods are in tension, and the plugs are in the base of the cylinders. This idea also seems worth experiment.

Mr. Loening further said that the radiator question is of great interest, and it had been found in America that it was a mistake to have the radiators in front of the engine, motor-car fashion. In Mexico, where the temperature was below freezing at night and 120 degrees in the sun in the day time, it was found better to have the radiators up on top or to one side in the full blast of the airscrews.

Reverting to the subject of automobile engines in aeroplanes he remarked illuminatingly that the idea is as foolish as the idea of motor-car makers in the old days who designed car-bodies to look like horse-carriages.

Lieut.-Colonel MERVYN O'GORMAN, C.B., said that he was glad to hear Mr. Coatalen admit that an aero engine was not merely a car engine which had been scraped down in weight. A most important desideratum of aero engines is that when they are switched off or throttled down they shall be capable of starting again immediately they are switched on, or the throttle is opened, and shall recover their full power at once. Many otherwise good engines have suffered from not picking up when opened out suddenly. One of the lightest engines has been particularly bad in this respect.

He agreed that the steep angles to which aeroplanes are put under modern war conditions, as when diving or stalling, or when



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fighting, is a more important reason for the dry sump system of lubrication, than the actual cooling of the oil, for which reason some engines are now fitted with pumps at both ends of the sump. He gave it as an opinion, with which, of course, everyone will agree, that the evolution of the aero engine to its present degree of development is due to the war, and he agreed with Mr. Coatalen's dictum that the development of any engine must be due largely to the common sense and intelligence of the purchasers. Which fact has a direct bearing on the aero engine. It is also important in his view not to have prejudiced purchasers.

He was glad Mr. Loening suggested sending copies of the paper to the United States to enlighten the opinions of those concerned with aviation in that country. He expressed some surprise at hearing that Mr. Loening did not approve of having radiators in front of the engines. He remarked that he had found in Italy that engines with as many as eight cylinders in line were found satisfactory in certain types of machines. Colonel O'Gorman also congratulated Mr. Coatalen on the number of experiments permitted to him.

Mr. HANDLEY PAGE remarked that one point which some engine designers forget is how to get radiators into an aeroplane. Sometimes it is impossible to get a radiator between the front cylinder and the propeller boss. He has tried putting radiators outside engine nacelles, and finds that it increases the total head resistance of the nacelle enormously, but he has not tried putting them at a distance from the engine.

One commends to the consideration of Mr. Page and other designers the idea of experimenting with radiators built into the upper plane in the fashion common to so many German machines.

Mr. PAGE referring to the importance of an intelligent purchaser to the designer of engines, remarked that the only purchasers of aircraft at present are Governments. Whereupon, Colonel O'Gorman interjected a remark to the effect that this was precisely the point to which he had referred in this connection.

Lieut. ARCHIBALD LOW, R.N.V.R., said that for some two and a half years he had been watching assiduously the combination of engines and aeroplanes under something approximating to war conditions. He pointed out in reference to one of Mr. Coatalen's closing remarks that only at the beginning and end of a flight is an engine operating at sea level, and that tests on dry land are not by any means necessarily at sea level. He inferred that, consequently, h.p.'s procured under such varying conditions are not necessarily accurate. He said that he has never yet seen engine test-sheets marked with barometric, thermometric, and atmospheric-density readings prevailing at the time of the test.

Constructors might, perhaps, ask users what such things mattered to them if results were attained, and if they were given the necessary power for weight. He pointed out that in calculating the ceiling of a machine one has to take in the percentage of mechanical losses, and that in selling a motor to an engine user a designer may be asked what are his mechanical losses. He pointed out that in a rotary engine the purely mechanical losses are less than in a stationary cylinder engine, so that other things being equal, the ceiling for a rotary will be higher than a stationary, given the same power at sea level. Weight per h.p. operates as the square and not directly, and it is a mistake to think that mere h.p. irrespective of weight is not important.

Mr. HILL agreed that the ratings of engines is important, and proposed a simple formula as desirable. His formula being:—

$$D^2 S N R$$

$$7,500$$

Where D equals diameter of the cylinder.

S „ the stroke.

N „ the number of cylinders.

R „ the revolutions per minute.

He was of the opinion that most of the noise made by aero-

planes was due to the propeller rather than to the exhaust of the engine.

An Officer of the Naval Air Service, whose name was not disclosed, joined in the discussion in the candid manner of the bluff and hearty sailorman. He said that he did not agree about the remarkable progress which has been made. After two and a half years' experience of the Service he did not think we have any more reliability in engines than we had at the beginning.

[One would like to have E. Section's reasons for this.]

Engine makers never tell him what their engines do in the air, they always tell him about their bench tests. Bench tests are made with a whole hydrant running through the engine to keep it cool, but in the air the water boils away or the magneto falls to pieces. Faults of all sorts come to the notice of the active service pilot which could be rectified earlier if engines were tested in the air before being sent on active service. He said that he does not like British magnetos, and he wound up by saying that when British engine makers' engines habitually do six hours in the air without any trouble, he will admit that they have made progress.

Making all due allowance for the breezy Naval method of argument, one is rather inclined to agree that aero engine makers should be given facilities by the intelligent Governmental purchasers for a greater amount of testing in the air than does, actually take place. One feels sure that all engine makers would welcome facilities for such tests provided that the tests can be carried out under the supervision of the designers and their mechanics, and that their experimental engines are not handed over bodily to be torn to pieces and re-assembled by ordinary mutton-fisted Service mechanics and damned in heaps by unintelligent experts for mistakes made by the testers.

Mr. BERTRAM COOPER remarked that the noise made by aeroplane propellers is not due to fluctuation of torque, and that anybody who has had much to do with wind tunnel experiments made with electric motors realises that the noise is equally hellish. One suggests, however, that the propeller noise is inaudible above 5,000 feet, whereas an open exhaust can be heard for miles.

Mr. LOUIS COATALEN, in replying on the discussion, remarked that he has tested sparking plugs carefully when placed in the cylinder-head and in the side of the cylinder, and has always found more power from the plug in the head. He believes that it is because the spark takes place near the centre of gravity of the mass of gas, and so propagates a better explosion. When one is forced to have plugs at the sides of the cylinder it is better to have one on each side, and fire both at once. In that case it is difficult to synchronise the spark, and he finds that one plug in the centre of the head is just as good. One may point out in support of this that anyone with any experience of racing cars during the last nine years could have told Mr. Coatalen's critics this much.

On the subject of dry sump lubrication, Mr. Coatalen said that the oil supply is not put outside because of the reason suggested by his critics, as it is very easy to make a base-chamber from which the oil would not flow to the cylinders.

Further, he pointed out that the Sunbeam Works barometric measures are always measured while engine tests were in progress.

Mr. HENRY FOWLER proposed a vote of thanks to Mr. Coatalen in a hearty and sincere manner, which showed his thorough appreciation of the value of the paper.

General RUCK thanked Mr. Fowler for deputising so ably as Chairman, and proposed that Mr. Fowler should be made permanent Deputy-Chairman of the Society. One heartily endorses such a proposal, as Mr. Fowler is not only gifted with clarity of utterance, which is of great use in introducing those taking part in discussion, but has himself a pretty wit which is of high value in introducing, as well as curtailing, over-lengthy discourses.

authorities may find it worth while to consider the question when the next series of lectures comes to be arranged for next winter. This paper has done its best to spread throughout the Flying Services the substance of these lectures, but a good many points are raised during the lectures which it would not be wise to put into print, and it is also impossible to reproduce all the diagrams and illustrations, which are generally highly educative.

The continued decrease in the supply of paper makes it very doubtful whether it will be possible to devote even as much space to educative matter in the future as has been done lately. It is, therefore, all the more desirable that officers should hear the lectures for themselves.

A WAR NECESSITY.

Owing to the demands of Government Departments, the Triplex Safety Glass Co., Ltd., are unable, at present, to execute the numerous orders they have received from private individuals and firms. These, however, will be dealt with in strict rotation as opportunity offers.

LECTURE ATTENDANCES.

Apologies for the absence of R.N.A.S. and R.F.C. officers from the Aeronautical Society's lectures, on which fact comment has been made at times in this paper, one learns that a good many such officers would like to attend the lectures but find it impossible, or, at any rate, very difficult to obtain leave for the purpose.

Observers from France who are under training as pilots, as well as cadets who are under training within reasonable distance of London, would often like to attend these lectures, and if leave can be granted to them without interfering with their duties on the following morning, it might be very well worth the while of the R.F.C. authorities to consider the matter of issuing special instructions on this point. The same remarks apply to R.N.A.S. officers under instruction with at least equal force, seeing that there are so many of them within even easier reach of London than are R.F.C. officers.

It is, perhaps, rather late to raise the question at this date, because the majority of the lectures are now over, but possibly the

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FUNDAMENTAL RESTRICTIONS.

"White to play, and mate in four moves." Two-stroke design is like nothing on earth so much as one of those awesome chess-problems in which, with nothing more than the usual reactionist king, a diagonally-minded bishop, a lonely rook, and two or three undisciplined pawns, one is asked to make the incredible the inevitable, according to the laws of the game, even if one has to compromise on a principle or two.

In both cases one has the absolute minimum of material to do with. Therefore to think of everything that can possibly be done with it. That is why, as I said, one must put in positively all one knows. That is the reason for sacrifice, and compromise upon a loss or two, be it a pawn or an orthodox port-position. Off-setting that loss, or turning it into positive gain, thus becomes the equation of skill, in either case.

We are supposed to be playing for valvelessness and fewness of working-parts fundamentally. Here, then, is the problem. Having conceded the general ideal of simplicity—as one imagines—it must next be considered from the standpoint of non-infringement in an already restricted field. Even if the means are not original, the object for which they are used must be, and be so stated, very definitely. That shoal successfully weathered, one must review the entire proposition, in the light of the commercial considerations of foundry and machine-shop requirements, and of production generally. Thus one must indeed learn to steer small, if nothing else.

IDEALS AND ACCOMPANIMENTS.

The second, or transference, stage of the induction system of this "Sans" two-stroke design affords a cogent example of all this, as I found. In order to preserve the "Sans" ideal of pipelessness and general elimination of castings, external to the motor-mass, as well as of getting a practically jointless, yet readily detachable one-piece water-jacketing, I had already bound the design to the X-shaped transfer-storage chamber, and to its intermediate position relatively to each pair of cylinders.

However, embodied as it was with the duplicate upper-and-lower belt casting—which, as we have seen, also permitted the cylinders to have the simplest casting and machining, as well as unit-mounting and detachment—all the foregoing mechanical objects had been duly attained; as well as the physical advantages of circulatory primary induction without backlash and the—apparently—definite assurance of forced secondary induction into the working ends.

Nevertheless—as will now be apparent—between the primary

and secondary induction came transference; before that assurance of forced secondary induction—or any at all—could be fulfilled. Here all at once the whole working-scheme was opposed to one of the few limitations of the differential piston: which is, that having drawn in its charge on the out-stroke, it compresses it too much on the in-stroke, either before or during delivery into the transfer chamber, unless some special means be adopted to offset this result.

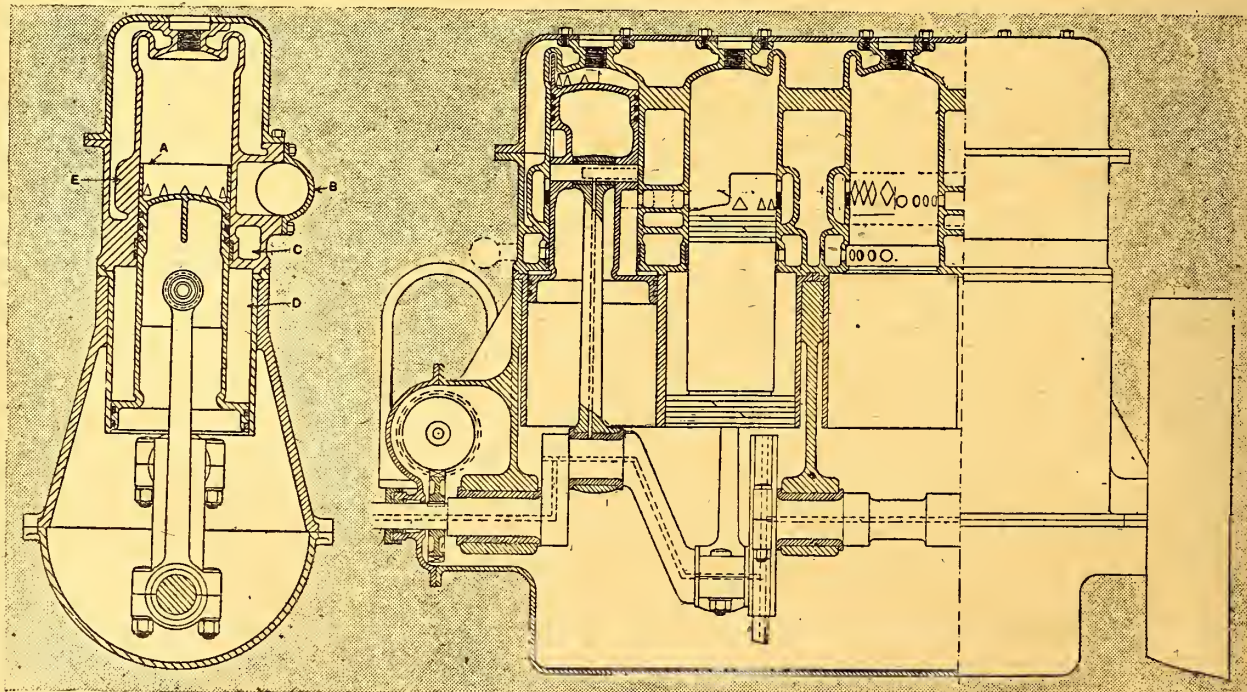
Obviously, all this sets up increasing resistance and negative work: thus diminishing by so much the positive work done on the crankshaft, and hence the total mechanical efficiency of the motor. It must also tend to serious back leakage, call for special compression rings, otherwise too tight-fitting; and would be liable to affect even lubrication very seriously; all obscure but no less ruinous defects in an aero-motor.

Furthermore, even if these last probable troubles were overcome, such an otherwise inevitable power-loss will clearly be equal to, if not more than, the cam-shaft and valve-gear losses in a four-stroker. And so, apart from rendering the two-to-one power gain ideal out of the question, it would make any other two-stroke advantage more or less academical.

AND ITS REMEDY.

Consequently—relying on the fact that the mixture after all is but a fluid—the only adequate solution of the difficulty that threatened the whole proposition appeared to be this: that having formed the piston as a D valve—horizontally semi-lunar—as to its upper part, for the purposes of vacuum-relief and primary induction, the lower part of the trunk opposite should be formed with as large a cavity as possible, to serve as a moving vertical mixture-decanter—D; delivering the charge—which would naturally run into the cavity during the in-stroke—to the transfer chamber at a greatly reduced pressure. At any rate, a pressure only so far greater as to ensure the transfer-chamber being filled, and the charge stored therein at sufficient pressure to ensure forced secondary induction.

In this way, at any rate, negative resistance would be greatly reduced, if not eliminated: and the pressure-stages of mixture transference would be gradual and easy. On the other hand, since the plus factor one way is balanced by an equivalent minus on the other—what with the increase of pumping-chamber capacity, there would be a greater vacuum to fill on the out-stroke. So an ample, if not excessive, volume of mixture was assured for the primary induction, when, at the end of the out-stroke, the



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upper D valve cavity came into coincidence with the lowest row of ports and the pumping-chamber, to effect the *appel brutal*; which, in the circumstances, would be all the stronger.

The body of the piston was, therefore, designed more or less as illustrated; the mechanical advantage—again further consequent upon the intermediate position of the transfer-storage chamber—being that the mixture decanting-transference cavity of the piston was entirely clear of the oscillation of the connecting-rod.

THE WORKING-CYCLE.

Thus it will be seen that communication between the upper and lower belting—indeed, the entire cycle—is effected by the pistons, owing to their special form, which enables the valveless ideal to be realised entirely. To follow the cycle through, briefly, we have first the upper semi-lunar recess—which is gridded to avoid interference with the choke-ring at the bottom of the cylinder, and is placed, as illustrated, between the compression-rings and the gudgeon-pin—descending; and at the full out-stroke, uncovering the semi-circle of induction ports from the lower belt C, and giving free passage into the annular pumping-chamber for the mixture, rapidly induced by the vacuum created.

Immediately the in-stroke begins on this piston—simultaneously with the working-stroke above, and the creation of a similar induction vacuum by the adjacent piston—the charge is compressed and gradually gathered into the vertical decanting recess D on the opposite side. As soon as the in-stroke is completed the compressed and decanted charge is expelled through another semi-circle of ports nearly midway up the cylinder wall into the X-shaped transfer-storage chamber, which, as has been said, surrounds each adjacent half of the cylinders.

From this storage, however—for by this time the other piston is at full out-stroke—the charge is forced through the *corresponding* semi-circle of ports into the working end of No. 2 cylinder, there brought to compression, fired and exhausted.

But the pumping end of No. 2 cylinder has meanwhile performed the same function of primary induction and supply for the ultimate use of No. 1 cylinder, by way of the same central transfer-storage chamber, and the same row of ports that had just served for the secondary, final induction of the first charge: the corresponding row of ports in No. 1 cylinder that had served for the transference of that charge now admitting the second charge in final induction from the transfer chamber.

AND ITS SPECIAL FEATURES.

Thus it will be evident, in the first place, that this unique two-way alternate transfer and induction function of these oppositely corresponding ports, serves to keep them constantly cool with fresh mixture. This result, desirable as it is—if not essential—in any two-stroke motor, is at any rate peculiar to this design; and is, of course, a further consequence of the special central position of the transfer-chamber; again due to the postulate of pipelessness.

Beyond this, it will be self-evident that not only is the transfer-chamber kept constantly charged with mixture under pressure, and full charges thus assured; but that the pressure degree is kept practically constant. Mechanically, too, length of transference is reduced to the minimum, and directness brought to the maximum; which of course tends to keep the temperature of the mixture constant.

So much for the induction. As to the exhaust, reference to the elevation view of the illustration will show that the exhaust ports are also in semi-circular series, but opposite to, or rather higher than, the combined transfer-induction ports. Their part of the upper belt is, however, completely water-jacketed—more so than is possible with the exhaust of any four-stroke—and it will also be seen from the vertical section that the belt runs out into passages in the water-fosse wall. This side of the casting

is concave throughout its length, and thus forms one half of the exhaust conduit B; the outer half of which—an open trough—is the only externally-applied part on the motor.

The special feature of the exhaust system in this "Sans" design is to be seen in the detail of the piston-head and the shaping of the exhaust ports. As to the former, in a later design, the piston is cast with a semi-circular D sectioned channel—freely perforated at the top with ports opening upwards—all round the induction ports and covering them completely. This is for the dual purpose of making backfire into the induction ports an impossibility at any speed or sudden speed increase or reduction, and for directing the charge stream upwards, clear of the exhaust.

SACRIFICE AND GAIN.

Further we note that to gain practically all the foregoing advantages, it has been necessary to sacrifice the orthodox position of the induction ports; i.e., above the exhaust: which is practically out of the question in a single-piston design. Direct valveless transference to ports in this position from the transfer chamber, *per se*, would be possible enough. But as it would leave free unguarded communication with the oncoming next charge in storage, it would be impracticable. Thus we must provide some adequate mechanical compensation. At any rate, something that, while protecting the oncoming new charge from pre-ignition, will prevent any of it being wasted into the exhaust.

So much is at least afforded by the D-shaped induction channel in its degree. Otherwise, there is nothing in the shape of the conventional deflector. And not even this detail appears in the original design as illustrated. Instead—and common to both designs—the feature is that, on the exhaust side, the piston wall is projected upwards into a kind of tongue or bulwark A, about two inches high, running half round the piston head so as to cover the whole range of the exhaust.

THE SPECIAL EXHAUST PORT SHAPING.

Now the exhaust ports in the cylinder wall—not the tongue—instead of being circular, are diamond-shaped, and are just twice the height of the inlet ports, which are on the same level as the lower halves of the exhaust ports.

In the piston tongue, however, at the bottom, a semi-circle of triangular ports is cut, coinciding exactly with the upper halves of the diamond-shaped ports in the cylinder wall.

The result of this special arrangement and port-shaping is that while the exhaust is as early as in any other design, even more complete for the burnt gases, and continuous to the end—as the triangular ports in the piston-tongue descend to full out-stroke—the actual connection between the two types of ports diminishes automatically towards the end until the opening is barely sufficient to release the pressure adequately.

AND THEIR UNIQUE RESULT.

But the new charge having now entered under pressure—yet with no risk of leakage through the exhaust openings, now reduced to *one-sixth* their size, be it noted—the further unique effect is that the *base lines* of the triangular ports in the guard come into action as the piston rises. And—paradoxical as it seems—they keep the total exhaust openings small, from the outset, and after the first half inch rise reduce them further until the diamond ports are completely cut out.

In this way, while pressure is, nevertheless, fully relieved, and the merely half burnt and still partially effective gases are retained, leakage of the new charge is wholly prevented. Thus period-overlap (and practically the entire effect of the Lahaussais retention, with all its consumption economy) are *automatically* obtained; with what result of increased efficiency it remains for experience to show, beyond all argument of power curves.

(To be continued.)

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MARKET REPORTS.

Prices given are for quantities on the usual terms.

May 17th, 1917.

COPPER.—Prices still remain at the level to which they descended at the beginning of May, and, although the current prices cannot be considered very excessive, it will be very surprising if there is not a further slight decline. There are ample supplies of this metal.

Current Prices.

Copper Ingot (Standard) ...	... £130 Cash.
Copper Sheet ...	... £105 per ton.
Copper Tube ...	... 20½d. per lb.
Brass Sheet 24 Gauge ...	... 16½d. per lb.
Brass Tube S.D. ...	... 17d. per lb.

TIN.—The American demands for Tin have considerably increased recently. This may be due to the report that an import duty may be placed upon it by the U.S.A. Prices are still advancing, and are now reaching a very abnormal figure, and, furthermore, there does not appear to be any indication of a reduction taking place.

Comparative Prices.

To-day ...	... £244
April, 1917 ...	... £217
May, 1916 ...	... £196
Highest Price, 1916 ...	... £205
Average, 1916 ...	... £182

LEAD.—There has been no change whatever in the price of Pig Lead; it is rumoured that we shall not get further supplies from Spain.

Current Prices.

To-day ...	... £30
Last week ...	... £30
Last month ...	... £30

STEEL.—The market is very firm indeed, and although the output of Steels has received a temporary setback, there is a general feeling that the total output of the country will soon be sufficient to meet the whole of the demands for Steel for National purposes; then, again, our Allies are not calling for as much Steel as they required 12 months ago. At the same time, prices are very strong, and there are slight indications that they will advance shortly.

Current Average Prices.

R.A.F. 1E Rounds, 8os. per cwt. Rounds, Basis.
R.A.F. 3A Rounds, 38s. per cwt. Rounds, Basis.
R.A.F. 9A Sheet Steel, 30s. to 32s. per cwt.

ALUMINIUM.

Official Prices.

Ingots ...	... £225
Remelted ...	... £210

TIMBER.—The prices of Hardwoods do not show any sign of easing; as a matter of fact, the market is very firm indeed. In last week's report the excess value of the imports for three months, ending March, 1917, over the same period in 1916, should have read, £34,134, and not £34 13s. 4d.

Silver Spruce is still very scarce and prices continue advancing to a most abnormal figure. No Admiralty shipments have arrived. English Ash is also advancing and everything indicates that it will continue to do so.

Current Average Prices.

Silver Spruce, 15s. to 16s., c.f.
English Ash, 13s. 6d. to 14s. 6d., c.f.
Walnut, 2s. 5d. to 2s. 7d., c.f.
Mahogany, 2s. 1d. to 2s. 4d., c.f.

Prices are for selection and delivery.

FABRIC.—The official notification has not yet been received of the prices for Fabrics, but the prices given below can be relied upon. There are ample supplies at present, and there is no apparent possibility of a further advance in price; in fact, it is difficult to see any justification for the present abnormal figure.

Prices.—17C Cloth, 29d. per yard, 36 in.
Spaced Fabric, 20d. per yard.

AN AMERICAN AIRCRAFT MANUFACTURERS' ASSOCIATION.

A society, which has been created in the interests of the American Industry, and known as the Aircraft Manufacturers' Association, has opened executive offices at 501, Fifth Avenue,

New York City, and is now taking measures to obtain information on the resources of manufacturers and the producers of raw material in connection with whose products enter into aircraft of all descriptions.

Manufacturers of small parts, fittings, and so on, and factories producing fabrics suitable for wing covering, are invited to submit samples and catalogues, together with statements as to their ability to produce, for the purpose of record.

It is intended that one of the objects of the Association will be to create a clearing house for the exchange of ideas and to obtain and standardise small parts and equipment, and in this way it is co-operating with the National Advisory Committee for Aeronautics.

AMERICAN TRADE NOTES.

The Benoist Aeroplane Company have placed in commission three 100-h.p. 3-seater flying boats for use at their school at Sandusky. A large 12-passenger boat is under construction, which will be fitted with a 350-h.p. 12-cylinder Roberts motor. This machine will be used in passenger-carrying between Sandusky and Put-in Bay.

A still larger machine is being laid down to be fitted with two Roberts engines of 350-h.p. each. This boat will be designed to accommodate 25 passengers, and will, therefore, be the largest passenger machine to be built.

It is reported that Mr. Orville Wright is returning to take an active part in the commercial field of aeronautics.

A new company has been formed, to be known as the Dayton-Wright Aeroplane Co., with 50,000 dollars capital. An allied concern, called the Wright Field Co., with a capital of 10,000 dollars, has also been formed; the offices are at Dayton, Ohio.

The directors are Messrs. Orville Wright, Edward A. Deeds, President of the Dayton Laboratories Co.; Charles F. Kettering, Harry E. Talbot, and H. E. Talbot, jun., the last being President.

The manufacture of aeroplanes will be undertaken, and the Field Company will conduct an aviation school, probably with assistance from the United States Army. The training of military aviators will be carried out at the school under the direct supervision of Mr. Wright, and the chief instructor will be Mr. Howard M. Rinehart. Machines equipped with Hall-Scott engines are already under construction.

The Richardson Aeroplane Corporation of New Orleans has begun the construction of a factory on the shore of Lake Pontchartrain.

The new flying school, which is being established by the Curtiss Aeroplane and Motor Co. on Lake Erie, is rapidly approaching completion, and will be opened at an early date.

C.A.V.

The Aircraft Industry is requested to note that the telephone number of C. A. Vandervell and Co., Ltd., of Acton Vale, has been changed from "Chiswick 1234" (six lines) to "Chiswick 2000" (eight lines).

The operators are in attendance at the firm's Private Exchange from 8.30 a.m. to 7 p.m. (Saturdays 8.30 a.m. to 1.30 p.m.). After these hours the Exchange lines are connected up as follows:—Chiswick 2000 Commissionaire (in attendance all night), 2001 The Executive, 2002 Cashier's Dept., 2003 Works Manager's Dept., 2004 Installation Dept., 2005 Dispatch Dept., 2006 Purchasing Dept., 2007 Order Dept.

A TRADE NOTICE.

John Remer and Co., Ltd., the well-known timber merchants, whose head office is at 14, Dale Street, Liverpool, advise the aircraft industry that for family reasons in connection with the estate of the late Mr. J. S. Remer, they have converted the business into a Private Limited Company, under the above style.

All the capital in the business standing to the credit of the late senior partner has been retained in the business by the issue to his executors of 6 per cent. preference shares.

It will also be of interest to the numerous friends of the firm to know that the memorandum and articles of association have been so worded that no issue of debentures will or can be made.

Mr John R. Remer is the governing director of the firm, which, with its stocks carried at Liverpool, Manchester, Garston, Glasgow, and sundry other ports, has one of the biggest businesses of its kind in the country, and has already secured a large share of the aircraft industry's business.

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THE PATENTS INDEX.

The subjoined index of recent inventions has been specially compiled by THE AEROPLANE from the current Official Patents Records.

PATENT APPLICATIONS.

Aeronautical Instrument Co., and another. Ripping panels for balloons, etc. No. 6472. May 7th.
Birkigt, M. Combined gun and engine for aerial machines. No. 6561. May 8th.
Buckham, Sir G. T., and another. Aircraft gun mountings. No. 6677. May 10th.
Frost, C. R. B. Thrust bearings of aircraft propeller shafts. No. 6789. May 12th.
Hunnable, A. Airships and aeroplanes. No. 6473. May 7th.
Johnson, V. Aeroplanes. No. 6653. May 10th.
Pease, H. Aircraft. No. 6494. May 7th.
Porter, J. R. Aeronautical machine. No. 6593. May 9th.
Russell, H. G. Mechanism for operating toy aeroplanes, boats, etc. No. 6790. May 12th.
Samuel, W. Automatic stabiliser and controller for aeroplanes, etc. No. 6744. May 11th.

COMPLETE SPECIFICATIONS ACCEPTED, PRINTED COPIES OF WHICH ARE OBTAINABLE ON AND AFTER MAY 31ST, 1917.

105,944. April 4th, 1916. Calthrop, E. R. Parachutes.
105,948. April 29th, 1916. Holroyd, T. H. Flying machines.
105,977. May 4th, 1916. Sloper, T. Pneumatic cushioning-devices for aircraft.
106,049. Oct. 21st, 1916. Steinmetz, J. A. Means for destroying aircraft.

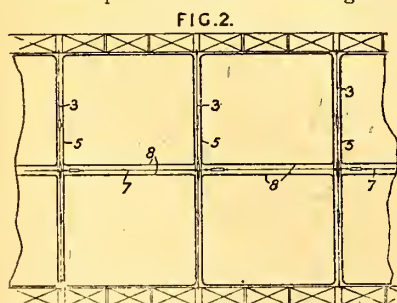
RECENT ABRIDGMENTS OF PUBLISHED SPECIFICATIONS.

104,747. Aeronautics. LUPTON, T. N., and LUPTON, T. N., 56, Broadway, Sheerness. March 21st, 1916, No. 4151. [Class 4.]

Propelling.—Mechanism for feathering propeller blades is shown applied to a propeller comprising blades 1 having radial spindles 1¹ mounted in a wheel 4 carried by a rotary shaft 4¹. Fig. 3 shows one blade only. The mechanism comprises pins 12 coupled together and sliding in an eccentric slot 9 and connected by links 19 to arms 7 on the propeller spindles 1¹. As each blade comes into the feathered position, the arm 7 thereof abuts against a stop 8 on the boss 5 of the wheel 4 and the movement of the pins in the eccentric slot is thus effected. The slot may be formed by two plates 9^a, 9^b connected by brackets 10 secured to a fixed plate 11, and the pins 12 may be coupled together by a pair of rings 13, 14. The links 19 have a ball-joint connection 7^a with the arms 7, and they may have a similar connection with the pins 12; or, as shown, a swivel block 15 may connect these parts.

104,769. Aeronautics. SHORT, H. O., 56, Prince of Wales' Mansions, Queen's Road, Battersea Park, London. April 3rd, 1916. No. 4862 [Class 4.]

Aerostats.—In rigid airships, the radial stay wires forming the transverse partitions between the gas-containers are connected



together throughout the airship by longitudinal flexible connections, to prevent distortion of the partitions when one of the containers becomes deflated, or when the airship is inclined. In the form shown in Fig. 2, the flexible connections 7 connecting the partitions 3 are arranged in tubes 8 formed

centrally through the containers 5. In a modification, the tubes 8 are omitted, and the flexible connections are secured internally to the opposite sides of the containers, additional connections being secured externally to the sides of the containers.

THE GNOME ENGINE BOOK.

All those concerned both with the care and use of the monosoppe Gnome engine should make a point of buying a copy of the second edition of the "Gnome Mono Instruction Book," which has been placed upon the market by the manufacturers of that engine with a view to educating the aviation public.

The "Mono" book contains a systematic dissertation upon the disassembly, cleaning and erection of the Gnome engine, in language to be understandable of the multitude. The outstanding feature of the book, however, is the inclusion of a large number of photographs illustrating every operation.

The book is well printed upon art paper and is tastefully bound in cloth. It is remarkably cheap at the price of 4s. 6d. net. Copies may be obtained at 5s., post free, from the Wm. Dawson Publishing Co., Ltd., 2, Breems Buildings, E.C.4.

A RECENT APPOINTMENT.

Those who worked at Brooklands in the early days of aviation will be interested to hear that Mr. Frank Berryman, who was one of the partners in Howard Flanders, Ltd., has been appointed assistant works' manager, under Mr. Bruce, at the Westland Aircraft Works of Yeovil.

At the outbreak of war, Mr. Berryman enlisted in one of the Public School battalions, and saw considerable service. He came home to take up a commission, but was brought out of the Army specially for aircraft work with a firm in the north. After gaining experience there, he has now transferred to a more responsible position in his own part of the country.

VALVE STEM LUBRICATION.

The firm of Brown Bros., Ltd., are making an ingenious attachment known as the Duco Valve Stem Lubricator, the patent rights of which they have taken over, the ingenuity of which entitles it to success.

The lubricator consists of a tubular wick kept in shape by a light spiral spring. The purpose of this lubricator is to act as a jacket for the valve stem. After being soaked in oil, it is pushed thereon, and inside the valve spring. As the valve stem works up and down, the oil finds its way up the valve guide, preventing it from getting dry and making the valve work smoothly and quietly.

It is claimed that these lubricators make a wonderful difference with sluggish engines (provided, of course, that the carburation and ignition is in perfect order). They tangibly increase the power and facilitate starting, whether by means of a crank or a self-starter.

Another advantage claimed is that the use of these lubricators on engines which throw up oil through the tappet guides results in this oil being usefully employed in lubricating the end of the valve stem. The Duco Valve Stem Lubricator is supplied in sets of eight for £1 per set for cars (15s. per set for Fords), and, in ordering, particulars must be given of the make and date of car; distance from end of valve guide to spring seat; lift of valve; diameter of valve stem; diameter of inside of valve spring.

Although designed primarily for automobile engines, these lubricators seem very well worth while trying upon stationary aero-engines.

METAL SUPPLIES.

Aircraft constructors, who wish to procure supplies of soft brass sheets for tipping propellers and similar work, are recommended to apply to Messrs. Herbert Lucraft and Co., 147, Fenchurch Street, E.C.3. This firm is in a position to deliver such sheets, 4 ft. by 2 ft. by 24G, to Admiralty test 2 B 10.

The firm also undertakes the execution of various metal castings in aluminium, brass, iron, phosphor bronze and gun-metal, and are prepared to receive inquiries for such work. They also supply solder, wire nails, and bolts and nuts, zinc sheets for templates, also tinned sheets and leadcoated for body work, brass and copper sheet rods, tubes, wires, rivets, etc.

METAL FITTINGS.

Aircraft constructors and subcontractors for aeroplane parts who find it hard to get metal fittings such as sheet metal clips, machined drop-forgings, pressed parts, and so forth, are strongly advised to communicate with Arnott and Harrison, Ltd., of Scrubs Lane, Willesden, London, N.W., as to their needs.

Both Mr. Arnott and Mr. Harrison have had much experience of high precision engineering, and reliance can be placed on the accuracy and finish of the work turned out under their supervision.

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Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds

Bleriot & Spad Aircraft Works, Addlestone, Surrey

Boulton & Paul, Ltd., Rose Lane Works, Norwich

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol

British Caudron Co., Ltd., Broadway, Cricklewood, N.

Central Aircraft Co., Palmerston Works, High Rd., Kilburn, N.W.

Curtiss Aeroplane Co., L. J. Seely, Clun House, Surrey St., Strand, W.C.

Davidson Aviation Co., Ltd., Hammersmith, W.

Eastbourne Aviation Co., Ltd., Eastbourne

Grahame-White Aviation Co., Ltd., London Aerodrome

Handley Page, Ltd., 110 Cricklewood Lane, N.W.

Mann, Egerton & Co., Aircraft Works, Norwich

Martinsyde, Ltd., Brooklands, Byfleet

National Aircraft Co., Ltd., 15, Hackney Rd., N.E.

Navarro Aircraft Co., Ltd., Burton-on-Trent

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2.

Norman-Thompson Flight Co., Ltd., Bognor

Roe, A. V., & Co., Ltd., Manchester

Sage, F., & Co., Ltd., Peterborough

Saunders, S. E., Ltd., East Cowes, I.O.W.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W.

Sopwith Aviation Co., Ltd., Kingston-on-Thames

Standard Aircraft Manufacturing Co., Effingham House, Arundel St., W.

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.

Waring & Gillow, Ltd., Hammersmith

Westland Aircraft Works, Yeovil

White, J. Samuel, & Co., Ltd., East Cowes

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ALUMINIUM CASTINGS—

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Willans & Robinson, Ltd., Victoria Works, Rugby

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Robinson & Cleaver, Ltd., Regent St., London, W.

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B. D. V. Aircraft Spares, Syon Chambers, 16a, Kew Road, Richmond, Surrey

Central Aircraft Co., Palmerston Works, High Rd., Kilburn, N.W.

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland

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MacLennan J., & Co., 30, Newgate St., E.C.1., and at Glasgow

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British Aeroplane Varnish Co., Ltd., Milburn House, Newcastle-on-Tyne, and 166, Piccadilly [S.W.]

British Cellulose Co., Ltd., 8, Waterloo Place, Cellon, Ltd., Broad St. House, New Broad St

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Beatty School of Flying, Ltd., London Aerodrome

Beardmore Aero Eng., Ltd., 112, Great Portland Street

Dudbridge Iron Works, Ltd. (Salmson), 87 Victoria St., London, S.W.

Gordon Watney & Co., Ltd., Weybridge

Green Engine Co., Ltd., Twickenham

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W.

Sturtevant Motors Co., 147, Queen Victoria St.

Sunbeam Motor Car Co., Ltd., Wolverhampton

The Gnome & Le Rhone Engine Co., Ltd., 47, Victoria St., S.W.

Willans & Robinson, Ltd., Victoria Works, Rugby

FLYING SCHOOLS—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth

Dutton Aircraft, Chester Aerodrome, Chester

GALVANISING—

Cowper-Coles Manufacturing Co., Sunbury-on-Thames [Norwich]

Boulton & Paul, Ltd., Rose Lane Works, Norwich

GEARS—

Moss Gear Co., Ltd., Thomas St., Aston, Birmingham

GLUE—

Adams & Co., Ltd., West Bromwich

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Mendline Co., 8, Arthur St., E.C.

GOGGLES—

Triplex Safety Glass Co., Ltd., 1, Albermarle St., Piccadilly, W.1.

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The Sperry Gyroscope Co., Ltd., 15, Victoria St., London, S.W.

HEATING AND VENTILATING—

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Chas. P. Kinnell & Co., Ltd., 65 & 65a, Southwark St., London, S.E.1.

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The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry

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Chas. Clifford & Son, Ltd., Birmingham

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Accles & Pollock, Ltd., Oldbury, Birmingham

Aircraft Supplies Co., Ltd., 17, John St., Theobald's Road, W.C.

Bayliss, Jones & Bayliss, Ltd., Wolverhampton (Bolts and Nuts)

The Birmingham Guild, Ltd., 45, Gt. Charles St., Birmingham

Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds

Foster Engineering Co., Wimbeldon

Mann, Egerton & Co., Ltd., Aircraft Works, Norwich

Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham

Rubery, Owen & Co., Ltd., Darlaston

Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire

Selsdon Engineering Co., Ltd., Croydon

Thompson Bros., Ltd., Bradley, Bilston

Wooler Engineering Co., Ltd., Old Oak Lane, Willesden Junction, N.W.

METALS IN GENERAL—

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3.

METRIC BOLTS—

Cashmore Bros., Zota Works, Hildreth St., Balham, S.W.

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Anti-Glare Glass Co., Ltd., 78, Turnmill St., E.C.

Bowden Wire, Ltd., Willesden Junction

Brown Bros., Ltd., Great Eastern St., E.C

Edison Swan Electrical Co., Ponders End (Lamps)

Herbert Froid Co., Ltd., Chapel-en-le-Frith

Glasso Manufacturing Co., Ltd., 211, City Rd., E.C.

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(Continued from page 1310.)

WOUNDED.—Sortwell, Lt. A. R., A.S.C., attd. R.F.C.

MISSING.—Adams, Sec. Lt. F., R.F.C.

Jessopp, Lt. A. J., R.F.C.

Kelly, Sec. Lt. O. R., Northd. Fus., attd. R.F.C.

Kirby, Sec. Lt. H., R.F.C.

Sloan, Sec. Lt. C. R., R.F.C.

Williams, Capt. W. G. B., M.C., R.F.C.

KILLED.—R.F.C.—Fyffe, 65310 A. (Fife, Scotland).

AUSTRALIAN FORCE.—MISSING.—Steele, Sec. Lt. N. L., Flying Corps.

PERSONAL NOTICES.

DEATHS.

BEAUMONT AND ANNESLEY.—While flying a biplane on May 19th, Sec. Lt. Charles Leslie Beaumont, R.F.C., and Capt. James Ferguson St. John Annesley, R.A.M.C., were killed.

COUPLAND.—Lt. Charles Coupland, R.F.A., attached R.F.C. (killed in action on May 6th), was son of the late John Coupland, of Goscote Hall, Leicester, for many years Master of the Quorn, and of Mrs. Coupland, 16, Connaught Square. Born on Sept. 17th, 1884, he was educated at Stoneyhurst. He enlisted in the Middlesex Yeomanry, and received a commission in the 3rd Hussars. Afterwards he went out to France with the R.F.A., and then joined the R.F.C. as an observer.

CUTLER.—Lt. Herbert Cecil Cutler, Yeomanry, attached R.F.C., who was killed in action on May 10th, was the only child of A. Charles Cutler, The Cedars, Bromsgrove, Worcestershire. He was 26 years of age.

DE POMEROY.—Sec. Lt. Norman R. de Pomeroy, R.F.C. (reported missing on Oct. 20th, 1916, now unofficially reported killed in action on that date), was 24 years of age and the only son of Mr. Edward W. N. and Mrs. de Pomeroy, of Pantile, Aldington, Kent. He had his commission in the Army in Dec., 1915, and was gazetted flying officer in Sept., 1916.

DREY.—Lt. Adolphe Drey, M.C., A.S.C., attached R.F.C., who died on active service on May 9th, of accidental injuries, was the second son of the late Mr. E. Drey, of Roubaix, France, and nephew of Mr. O. Drey, Withington House, Withington, Manchester.

DUXBURY.—Sec. Lt. Herbert Cecil Duxbury, R.F.C., who was reported killed in aerial combat on May 11th, was the eldest son of Rev. A. Herbert Duxbury, Vicar of St. Mary Magdalene, Southwark, and of Frances E. Duxbury. He was aged 18 years.

HOLM.—Sec. Lt. Frank Diederick Holm, R.F.C., who was killed on May 14th, was the elder son of Mr. and Mrs. Frank Holm, of 17, Park Place Villas, London, and Thornham, Norfolk. He was in his 19th year.

MORRISON.—Sec. Lt. Norman Walter Morrison, R.F.C., who was killed on April 14th, was the elder son of Mr. and Mrs. Walter Granville Morrison, of Theydon, Reigate, and was educated at Hillside, Reigate, and Charterhouse (Weekites). He left Charterhouse in Dec., 1915, obtained his commission in Feb., 1916, and went to the front in Aug., 1916. His parents are informed that Mr. Morrison was killed while engaged on a very difficult and dangerous piece of work for which he had volunteered. He was 19 years of age.

NICHOLSON.—Sec. Lt. Geoffrey Arnold Nicholson, R.F.C., was the youngest son of Grace D. Nicholson, of "Surrenden," Staplehurst, and A. G. Nicholson, of Coonoor, South India.

OAKES.—Sec. Lt. R. C. Oakes, R.F.A., attached R.F.C. (reported missing on July 19th, 1916, now known to have been killed in aerial fight on that day), was the youngest son of Colonel and Mrs. Oakes, of Nowton Court, Bury St Edmunds. He was in the 10th year of his age, and had his commission in Oct., 1915.

O'BEIRNE.—Sec. Lt. J. I. M. O'Beirne, Royal Warwickshire Regiment, attached R.F.C., reported missing on April 3rd, and now unofficially reported killed on that day, was the younger son of Major O'Beirne, late Royal Warwickshire Regt., and Mrs. O'Beirne, Augherea, County Longford, Ireland, and was 23 years of age. He was educated at Summerfields and Radley College, and had just finished his three years' training at the School of Mining, Camborne, when war broke out.

He joined the Special Reserve of Officers in September, 1915, and went to the front, but was invalided home after the first battle of Ypres. Later he went to Sandhurst and received a commission, joined the R.F.C., and went to the front in May, 1916.

SENIOR.—Lt. Joseph Senior, R.F.C., son of Mr. A. Senior, of the West Riding (Yorks) Treasurer's Department, has died of wounds. He was 24 years of age, had had a brilliant scholastic career, and at the outbreak of war was at Wren's College, London.

THORNE.—Captain Guy S. Thorne, R.F.C. who died of wounds received in action on March 18th, was the only surviving son of the late Colonel Thorne, and Mrs. Thorne, of The Roseries, Bexhill-on-Sea.

TROUP.—Sec. Lt. John Guthrie Troup, Cameronians and R.F.C. (killed in action on May 13th), was youngest son of the Rev. G. E. Troup, Broughty Ferry. He was educated at Sea-

field House Preparatory School, Broughty Ferry, and at Rugby. He joined the Officers' Training Corps, St. Andrews, shortly after the outbreak of war, and in March, 1915, received a commission in the Cameronians (Scottish Rifles). In May of last year he went to France, and took part in the Somme and subsequent fighting. Recently he was attached to the R.F.C., and had been serving at the front for the past two months.

WILLIAMSON.—Lt. J. A. Williamson was killed while flying in Leicestershire on April 10th.

ENGAGEMENTS.

BAINES — ALLATINI. — The marriage arranged between Capt. M. T. Baines, R.F.C., and Miss Flora Allatini will take place at St. George's, Hanover Square, on Thursday, June 14th, at 2.30 p.m. No invitations will be issued, but all friends will be most welcome at the church.

BROCK—CAREY.—The marriage arranged between Lt.-Col. Henry Le Marchant Brock, D.S.O., R.F.C., and Daphne, elder daughter of Mr. and Mrs. Cecil A. Carey, of Hauteville, Guernsey, will take place quietly at Bath on June 9th.

JOHNSON—WHETSTONE.—The engagement is announced between Capt. William S. Fielding Johnson, M.C., Yeomanry and R.F.C., second son of Mr. and Mrs. Thomas Fielding Johnson, of Goscote Hall, Leicestershire, and Gwendolen Edith, daughter of the late Walter Whetstone, of Shirley Lodge, near Leicester, and Mrs. Ernest V. Hiley, of Beechfield, Edgbaston; present address, 31, Weymouth Street, Portland Place.

KENT—DEUCHAR.—An engagement is announced between Lt. Harry Kent, King's (Liverpool Regt.) and R.F.C., and Jessie Elaine, eldest daughter of Farquhar Deuchar, of Loansdean, Morpeth, Northumberland.

KNOWLES—BERNERS.—The marriage arranged between Capt. R. M. Knowles, M.C., Norfolk Regt. and R.F.C., and Miss O. M. Berners, will take place early in June.

WATERLOW—CLARE.—The marriage arranged between Lt.-Col. and Wing Comdr. C. M. Waterlow, R.N.A.S. and R.E., and Miss Joan Clare, will take place at 2.30 p.m. at Farnham, on Saturday, June 9th.

Col. Waterlow was one of the very first officers of the British Army to take an active part in aerial navigation. He worked on the first Army airships, and was one of their first and best pilots. He transferred with the airships when they were taken over by the Navy, and has since done a very great amount of airship navigation. All will wish him and his bride every happiness.

MARRIAGES.

BAINBRIDGE—EDWARDS.—On Tuesday, the 15th inst., at Christ Church, Sutton, Sec. Lt. G. A. Bainbridge, R.F.C., only son of Mr. and Mrs. Bainbridge, "Ivanhoe," Brighton Road, Sutton, Surrey, was married to Flossie, eldest daughter of Mr. and Mrs. T. H. Edwards, "Tugela," Aberystwyth.

COTTON MINCHIN—FULLER.—The marriage of Captain James Humphrey Cotton Minchin, Cameronians and R.F.C., only son of Mr. and Mrs. James Cotton Minchin, The Green, Wimbledon Common, and Miss Violet Fuller, third daughter of Mr. and Mrs. Claude Fuller, took place at Holy Trinity Church, Brompton, yesterday afternoon, the ceremony being performed by Canon Albert V. Baillie, of Coventry, assisted by Prebendary A. W. Gough, the vicar.

The bridesmaids were Miss Coralie and Miss Evelyn Fuller, sisters of the bride, Miss Minchin, sister of the bridegroom, Miss Audrey Noel, and Miss Joan Lloyd.

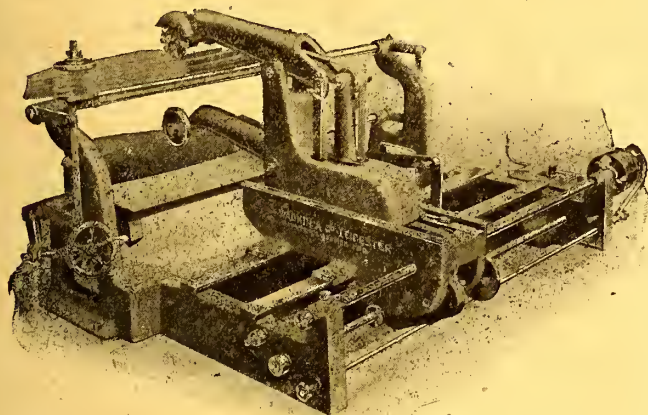
Major Chamier, D.S.O., Punjabis and R.F.C., was best man. Among those present were:—Mrs. Fuller, Mr. and Mrs. Cotton Minchin, Lord and Lady Aberconway, the Hon. Lady Norman and Miss Norman, the Hon. Lady Colville, Mrs. Arthur Colville, Lady Bonser, the Hon. Mrs. Alaric Grant, Lady Duckworth, Lady Mabel Egerton, Mrs. and Miss Rivett-Carnac, Sir Martine and Lady Lloyd, Colonel Baillie, Mrs. Albert Baillie, Lady Ward, the Hon. Florence Hereage, Colonel Marling, V.C., and Mrs. Marling, Mrs. Faudel-Phillips, Colonel and Mrs. Hans Hamilton, the Misses Seely, Sir Launcelotte Gubbins, Colonel Mulliner, Captain Humphrey Lloyd, M.C., and Captain Hardie.

JONES—OWEN.—On May 19th, at St. Mark's Church, Surbiton, Sec. Lt. Arthur Roland Jones, R.F.C., son of the late Rev. S. E. Jones and Mrs. Jones, of Diaporia, India, was married to Evelyn Owen, daughter of Mr. and Mrs. J. H. Owen, of Thornlea, Cranes Park, Surbiton, by the Rev. F. B. Norie (uncle of the bride), assisted by the Rev. Canon Potter, Vicar.

MACLAGAN—ADRIN.—On May 7th, at St. Mary's Church, Lynton, James P. D. MacLagan, Lt., R.F.C., was married to Susan Kearns, daughter of the late Robert Adrain and of Mrs Adrain, niece of David Kearns, "Cnoc-Alluin," Belfast.

MARSHALL—ORR-EWING.—On May 12th, at Holy Trinity, Weston-super-Mare, Herbert W. Hare Marshall, R.F.C., Sec. Lt., only son of the late Col. H. S. Marshall, Punjab Infantry, and Mrs. Marshall, of Revelstoke, B.C., was married to Evelyn Margaret, fourth daughter of the late Mr. John Orr-Ewing and Mrs. Orr-Ewing, of Holmer, Weston-super-Mare, by the Rev. J. S. Macnutt, assisted by the Rev. T. R. Winterton.

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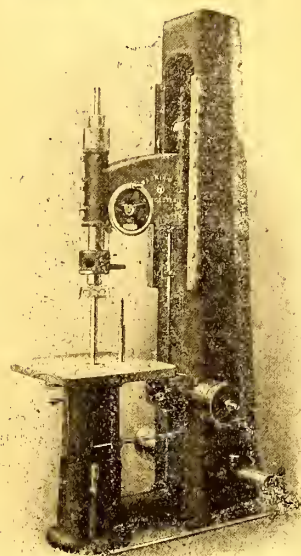
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BIRTH.

DANN.—On May 12th, the wife of Lt. A. G. Cleeve Dann, N. Lancs and R.F.C., of a daughter.

Capt. D. D. Sheehan, M.P., has received information from the War Office that his son, Lt. D. T. Sheehan, R.F.C., is "reported missing." Lt. Sheehan was a midshipman in His Majesty's ship "Hibernia" when the war broke out, and saw service in the North Sea. He was subsequently transferred to the Royal Naval Air Service, saw service in France and elsewhere, and was wounded. Lt. Sheehan was invalided for several months, and transferred to the Royal Flying Corps.

News has been received by Mr. Bransby Williams, the well-known character actor, that his son, Lt. G. W. Bransby Williams, is reported missing on the Western front. Mr. Williams, who is an old Dulwich College boy, is 19 years of age, and is attached to the Royal Flying Corps. He has been at the front for nearly two years.

Lt. Elgey, R.F.C., who has been missing since March 19th, is the only son of Mr. and Mrs. Elgey, Moorhead, Shipley, Yorks. He was born in 1891, and educated at the Bradford Grammar School and Oriel College, Oxford. He graduated with Honours in 1914, and subsequently obtained a First Class Division Clerkship in the Civil Service. He received a Commission in the Royal Field Artillery, and transferred in 1916 to the R.F.C. He received his wings in September, 1916, and went to France in February of this year.

Lt. Hills, R.F.C., was missing on March 9th. He was granted his commission on Sept. 8th, 1915, after serving in the Natal Mounted Rifles through the G.S.W. African campaign, and will be 21 years of age on May 21st. (Since the foregoing news arrived it is satisfactory to find that Lt. Hills' life is spared, and it is presumed that he is a prisoner in the hands of the enemy.) Mr. Hills is the son of Mr. and Mrs. A. L. Hills, 168, The Avenue, Itchin, Southampton.

Lt. Jay, of the R.F.C., has been reported missing since March 19th. No further news has been obtained of him, and any information will be gladly received by his wife, Mrs. T. W. Jay, Surrey Cottage, Littlehampton, Sussex. He, with several others of his squadron, had dropped their bomb successfully on —, and were returning to their own lines when they were met by a large hostile army of aeroplanes. A fight ensued and Mr. Jay was last seen fighting three Hun machines. His machine was then observed to go down and under control. The air battle took place over a portion of the territory where the Germans had been retreating, somewhere north of St. Quentin.

Lt. Pearson, R.F.C., who has been missing since March 9th, was for over 10 years on the staff of the Western Electric Company, Ltd., as an electrical engineer, and he had installed telephone exchanges in China, Africa and Australia. At the outbreak of the war he was in Antwerp with his firm and came home to join the University and Public School Corps in September. He was given his commission in a Northants Regiment, and later was attached to the Machine Gun Corps. He went to France in May, and in June he was awarded the Military Cross. In July he came home on leave and trained for the R.F.C.

He was gazetted Lt. in October in the Machine Gun Corps, and in November he gained his pilot's certificate in the R.F.C. at Upavon, and left for France on Dec. 20th, 1916. Mr. Pearson is the only son of Mr. and Mrs. G. Pearson, "Heath," Leighton Buzzard.

Sec. Lt. H. E. K. Eccles, R.F.C., who has been wounded, is the eldest son of Dr. and Mrs. Tocher-Eccles, well known in Hove. Until a year ago he was following his studies for the medical profession at St. Bartholomew's Hospital, but decided to take part in the war, and obtained a commission.

A postcard, dated April 11th, has been received from Sec. Lt. D. P. McDonald, Cameron Highlanders and R.F.C., who was reported "missing" on April 13th, stating that he is a prisoner at Karlsruhe and is not wounded.

From the "Daily Chronicle" of May 22nd:—

"... When is this scandal of the young mock officer to cease? We see him rigged up in all the paraphernalia of war, and learn on inquiry that this pseudo-soldier is a Flying Corps Equipment officer, or an Inland Water Transport officer, or in the Army Pay Department. And the crowning insult is to see these denizens of privileged Funk Holes accepting the salutes of real soldiers, men from Vimy Ridge and Arras, crippled heroes who have given their all to their country. . . .—From a Correspondent."

FRANCE.

OFFICIAL COMMUNIQUÉS.

MAY 16th.—During yesterday our pilots brought down three German aeroplanes.

MAY 17th.—In the period between May 8th and May 16th, Sub-Lt. Nungesser brought down three German aeroplanes, bringing up to 27 the number of machines destroyed up to the present by this officer. Sub-Lt. Dorme brought down in the same period his 23rd adversary, Lt. Doullin his 15th, Sub-Lt. Chaput his 11th, Adjt. Jailer his 9th, and Adjt. Casale his 8th. Finally Capt. Auger brought to five the number of enemy aeroplanes for which he has accounted.

MAY 19th.—Lt. de la Tour has up to the present brought down nine German aeroplanes, and Adjt. Douchy seven.

MAY 20th.—ARMY OF THE ORIENT.—There were artillery actions west of the Vardar. British aviators bombed enemy camps and depots in the region of Drama and near Doiran.

MAY 21st.—During the night of the 19th our bombarding aeroplanes dropped 2,200 kilos (over two tons) of explosives on the railway stations and bivouacs in the region of Epoye-Bétheniville (north-east of Reims). During the day of the 20th the aviation ground of Habsheim (Lorraine), the bivouacs of Pont Faverger (north-east of Reims), and Bétheniville also received numerous projectiles.

On the same day two German aeroplanes were brought down by our pilots, and a third was accounted for by the fire of our anti-aircraft guns. Three other enemy machines were compelled to land badly damaged.

The "Journal Officiel" on May 15th published the name of Lt. K. B. Burburry, an observation officer employed with a captive balloon attached to the Fourth British Army, who is mentioned in French Army Orders. It is explained that on Sept. 15th last his balloon drifted towards the German lines, the cable having been cut by a shell. Mr. Burburry ripped open the balloon at an altitude of 3,000 ft. before throwing himself out in a parachute, and thus prevented a balloon of a new French type falling into the enemy's hands.

Capt. René Doumer, of the French Flying Corps, son of Senator Paul Doumer, who has been reported missing, is now reported by the German newspaper, "Gazette des Ardennes," to have been shot down behind the German lines and killed.

It is reported that General Marioni, accompanied by Colonels Ricaldeni and Moize, has arrived in Paris from Italy to consult with the French aviation authorities.

GERMANY.

OFFICIAL COMMUNIQUÉS.

MAY 15th.—In air fighting six enemy aeroplanes fell behind the German lines and another made a forced landing.

MAY 16th.—Naval airship "L22" is missing since Monday. According to an official British report "L22" was destroyed yesterday morning by the British sea forces in the North Sea.—(Signed) Chief of the Admiralty Staff.

MAY 19th.—With unfavourable weather the aerial activity has been small during the past few days. We shot down 10 enemy aeroplanes yesterday.

MAY 20th.—The enemy yesterday lost eight aeroplanes as a result of air battles and anti-aircraft fire.

MAY 21st.—On May 20th the enemy lost 14 aeroplanes.

It is announced in the "Leipzig Volkszeitung" that a Zeppelin shed at Mockau, near Leipzig, has been destroyed in a storm.

Remarkable stories of the past, present, and prospective activities of the Zeppelin are told in the "Tribune" by Mr. Carl W. Ackerman, who has spent two war years in Germany.

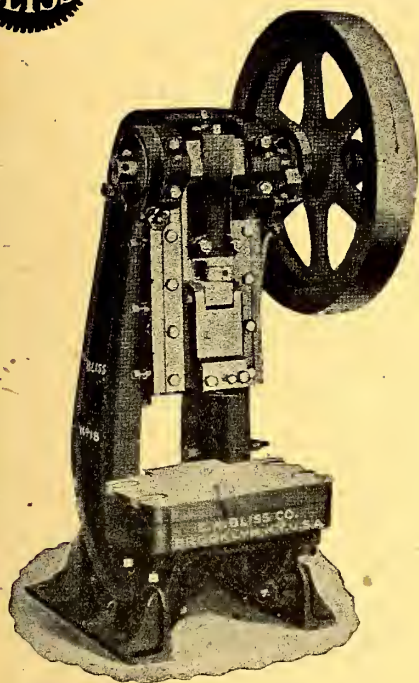
Mr. Ackerman quotes an Austrian captain commanding a Zeppelin for the statement that the German airships have flown from Namur, Belgium, where there is a base, to Constantinople, and also from Constantinople to Bagdad.

"Near Bagdad," said the captain, "the Germans were building a Zeppelin base for an attack on the Suez Canal"—a scheme to which General Maude's success has, of course, put a period.

Constantinople, according to the writer, would be in the hands of England and France to-day were it not for Germany's Zeppelins, which carried munition-machinery and powder from Temesvar to Constantinople when the Turkish capital would otherwise have had to surrender.

[Mr. Ackerman apparently possesses a vivid imagination, but insufficient technical knowledge to back it. Or else he is badly mis-reported.—Ed.]

The "Frankfurter Zeitung" reports that non-commissioned officer Festner, of Baron von Richthofen's squadron, who was responsible for the capture of Captain Leefe Robinson, V.C., R.F.C., has been shot down and killed.



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The following is from a Wolff Bureau dispatch:—

"For weeks past great excitement has prevailed in England about the heavy losses of machines and officers. The heads of the English Air Service are perpetually exposed to the sharpest attacks, and, above all, they are reproached with sending to the front, and keeping at the front, machines which cannot compete with the German machines. In spite of the strict censorship, we see in France also signs of similar dissatisfaction. The successes of our air forces in the month of April justify us in the conviction that the swaying struggle for supremacy in the air has at present been decided thoroughly in our favour.

"We, too, have certainly had heavy losses. The fight against so great a numerical superiority as we find against us in the West, and against so brave and tough an enemy as the Englishman undoubtedly is, is hard, and demands high sacrifices. But as in the fighting on the ground which our enemies expected to win by material superiority, so in the fighting in the air it is ultimately the man and not the machine that decides. And here we need have no anxiety; the spirit of Boelcke is still alive in our aviators."

[Which is not strictly true. German superiority, whenever it has existed for a period, has been due to the machines and not to the men.—Ed.]

RUSSIA.

OFFICIAL COMMUNIQUÉS.

MAY 16th. AVIATION.—Our air pilot, Lt. Golcher, brought down a German aeroplane, which fell within the enemy's lines, near the hamlet of Bolshovtso. Our air pilot, Vrikov, threw bombs upon Burshtyn.

MAY 20th.—After a fierce combat with a German Albatros one of our machines fell in the region west of Dvinsk. The machine was burned, and the aviator, Ensign Lintoff, and the observer, Staff Captain Steparenko, perished.

* * *

It was reported from Petrograd that on May 21st a German aeroplane dropped bombs on the railway station at Kishineff. A soldier and two children were killed, and five workmen were wounded.

AUSTRIA.

OFFICIAL COMMUNIQUÉS.

MAY 15th.—Our aviators were engaged in fights over the battleground with numerous Italian aeroplanes. Non-commissioned Officer Arrighi won his 11th air victory. Two enemy aviators were shot down in air fights, and two others by our anti-aircraft fire.

MAY 18th.—(With reference to the sea-fight in the Adriatic on May 15th, see British Admiralty communiqué of May 18th). The communiqué says:—

The participation in the fight of enemy U-boats and aviators had no success, while, on the other hand, our seaplanes splendidly took part in the fighting. They obtained one hit on each of two enemy cruisers, and effectively encountered hostile U-boats. Our units returned in full number, with small human losses and slight damage.

MAY 19th.—Our aviators shot down in an air fight two enemy aeroplanes, and a third was brought down by rifle fire near Vertoiba (south-east of Gorizia).

MAY 21st.—Our aviators brought down five Italian aeroplanes in aerial battles.

ITALY.

OFFICIAL COMMUNIQUÉS.

MAY 15th.—Aircraft activity was also very considerable. During the morning our machines bombed enemy hutments in the neighbourhood of Chiapovano (14 miles north-west of Gorizia). In the afternoon a strong squadron of our aeroplanes dropped about 200 bombs on encampments and supply columns on the enemy's lines of communication east of Gorizia. Our aviators, flying at about 500 metres (about 1,600 ft.) from the ground, opened fire with their machine guns on enemy troops which were there assembled, and dispersed them. All our machines returned safely.

MAY 16th.—The enemy's rear lines were yesterday again effectively bombed by our air squadrons, and, during the night, by one of our airships. Notwithstanding the attacks of numerous enemy machines and the fire of his batteries, we did not suffer any loss.

MAY 17th.—Last night one of our airships made a raid in the Frigido (Vippacco) Valley. Favoured by the clouds, our daring aviators descended to a low altitude, and dropped bombs and fired with machine-guns upon the enemy's cantonments. The airship afterwards returned safely to her base.

MAY 18th.—A semi-official statement with reference to the sea-fight in the Adriatic on May 15th (see British Admiralty communiqué of May 18th) says:—

At the same time our daring seaplanes, after repulsing the hostile machines in an aerial combat, attacked the enemy ships with bombs, and were subsequently able to confirm the serious damage suffered by them as the result of the fire to which they had been subjected. Two different aeroplanes reported that one of the enemy cruisers, which was completely shrouded in smoke, with its afterpart destroyed, was on the point of sinking close to Cattaro. All the units engaged in the actions returned to our bases, as also did all our aviators.

MAY 18th.—During last night one of our airships, under cover of clouds, was able to reach the enemy's rear lines east of Gorizia without being observed and bombed his encampments, returning safely.

MAY 19th.—Aerial activity continued to be intense. Our squadrons dropped bombs on encampments east of Canale and in the Gargaro Valley, returning safely to their bases.

Two enemy machines were brought down.

MAY 20th.—An enemy machine was brought down in an air fight above Feltre.

Italian seaplanes successfully dropped bombs on the military organisations on the Isle of Lagosta on Thursday, and returned undamaged to their base.

MAY 21st.—ON THE JULIAN FRONT.—Two enemy machines were brought down during air fighting.

* * *

It is reported that during the recent fighting east of Isonzo and north of Gorizia Italian aviators were very successful. Important enemy centres on the Bainsizza Plateau and on the off-side of Monte Santo were heavily bombed. An Austrian aeroplane was brought down on the Carso by an Italian flier. A seaplane while attempting to attack a captive balloon was also brought down by gunfire, and fell in the Italian lines.

* * *

The daily postal service from Pisa to Sardinia, and presumably vice-versa, is to be carried out by "six couples of aeroplanes" (seaplanes?) with six pilots in charge of them. Probably the service will have been inaugurated before you print this.

In the meantime a trial trip between Turin and Rome, and return, will be made by the O. Pomilio Co., with special 2½d. stamps and "speed-up" pillar-boxes at both ends of the journey. It is sincerely to be hoped that these efforts will become permanent.

No mention is made of censorial operations, so perhaps He will travel with the mail. [We can spare a few censors from this country if the Italian supply runs short owing to the carelessness of pilots.—Ed.]



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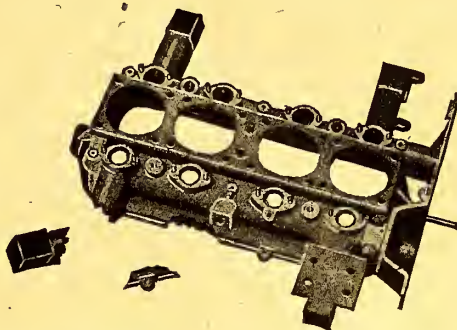
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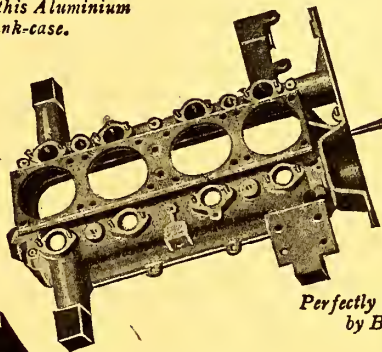
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One regrets to have to chronicle the death, in an accident while testing one of the latest products at Sesto Calende, of that excellent Swiss pilot Parmelin, who was the first man to cross Monte Rosa on wings. With several other men of value he put his services at Italy's disposition early in the European war.—T. S. H.

SERBIA.

OFFICIAL COMMUNIQUÉS.

MAY 14th.—Our aviators forced down an enemy aeroplane and dropped 24 bombs on the enemy camps near Konopishte and Mrezhintze. Good results were observed.

MAY 20th.—Our aviators dropped 54 bombs in the region of Konopishte and Rozden.

HOLLAND.

It is reported from Rotterdam that on May 7th a Zeppelin flew over parts of the eastern provinces of Holland. Coming from the direction of Hanover, the airship manoeuvred over railways and other points of importance on the Dutch frontier district, flying very low, and using searchlights and fireballs in order the better to carry out its inspection. The Zeppelin was repeatedly fired upon by Dutch frontier guards, also at one place by military cyclists.

It was reported from Amsterdam on May 11th that the "Gazette de Hollande" states that a subscription is being got up for the purpose of presenting a testimonial to the British aviator, Lt. Morrell, who, at the imminent risk of his life, dived into the sea from the pier at Sheveningen recently and saved a Dutchman from drowning. The British Minister at The Hague has consented to make the presentation.

NORWAY.

The "Politiken," of Copenhagen, states that the crew of the Norwegian barque "Royal," which was captured on April 23rd by a Zeppelin in the North Sea off Hanstholm, have passed through Copenhagen. They stated that the Zeppelin, which was numbered "L23," flew alongside the "Royal" and descended

to the water, on which she floated. A prize crew was placed on board the Norwegian ship. The Zeppelin carried a crew of 23 men.

U. S. A.

It is reported from America that Lt. Frank Wolf, a German spy, has confessed that Germany had planned to assemble Zeppelins in Mexico to operate on the Pacific coast. This imaginative young liar omits to mention how the Zeppelin parts were to reach Mexico.

The War Department has practically completed arrangements for opening a training school for pilots at Ashburn, near Chicago. Capt. Roy S. Brown will be the officer in charge. Seventy-five pupils will be trained at the school, which will be equipped with 48 Curtiss biplanes.

One hundred and twenty-five of the Columbia University, New York City, have raised what they call a flying corps, which has been approved by the National Aerial Coast Patrol Commission, and is to be known as the Aerial Coast Patrol Unit No. 4. The unit has been given a seaplane belonging to Mr. H. S. Borden. The training will take place at Long Island, the instructor being Philip Sims, who was formerly attached R.F.C.

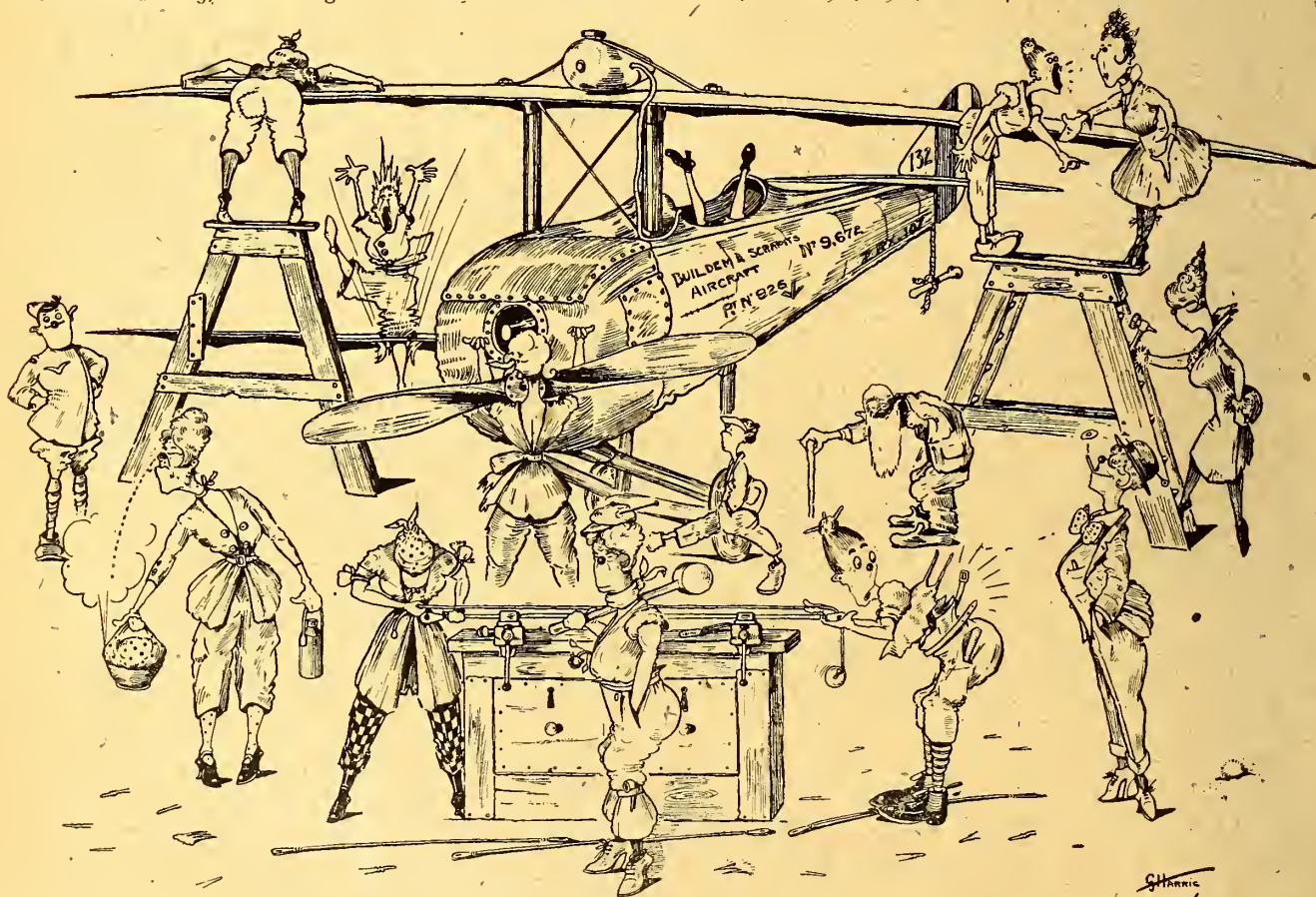
At a recent meeting of the Aero Club of America the award of the Club Medal of Merit to the following persons was announced:—

To Miss Ruth Law, American distance record cross-country, Nov. 19th, 1916, 512 miles.

Philip A. Carroll, for his patriotic work in training military aviators at Governor's Island, 1916.

Floyd Smith, American seaplane altitude records: Jan. 12th, 1916, one passenger, 12,333 ft.; Jan. 11th, 1916, two passengers, 9,524 ft.; Feb. 15th, 1916, three passengers, 9,603 ft.

Corp. A. D. Smith, U.S.A., American seaplane duration record, Feb. 19th, 1916, 8 hrs. 42 mins.

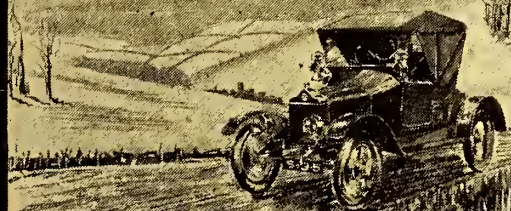


SCENES IN AN AIRCRAFT FACTORY.—XVI.—THE WOMEN'S ASSEMBLING SHOP.—In the foreground, an unskilled labourer goes to work, skilfully combining the typical labourer's rig with the feminine allurements of a rose in her blouse and a projecting hat-pin. Behind her, a nattily attired worker, and one more carelessly clothed, prepares stays (or bracing wires) for the aeroplane, watched by a feminine equivalent of the juvenile—and exempted—shop steward. On the left, a hungry worker senses the odour of a full dinner-pail, to the amusement of an R.F.C. superintendent, who, doubtless out of regard for his charges, has fastened his tunic, womanlike, to the left.

In the centre, a hefty wench essays to place an air-screw on the engine-shaft—wrong way round—and incurs the contempt of the boy passing through from a mere man's shop. Behind the boy, a patriarchal foreman watches operations; while above him, two workers discuss the merits of their respective costumes. Below them, a new worker finds a conventional dress inconvenient for the climbing of ladders. On the upper wing of the aeroplane, an energetic young woman lays out a spirit-level with dire results to two fellow-workers who are forcibly displaced, one through a lower wing and one into the pilot's seat. Feminine readiness of resource is shown in the method of weighting down the tail of the machine.

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James V. Martin, for the invention of the aerodynamic stabiliser.

Aerial Coast Patrol Unit No. 1, for its pioneer work in developing aerial coast defence.

In recognition of aviation service rendered at the Mexican Border, 1916: Major B. D. Foulois, Capt. J. E. Carberry, Capt. W. C. Kilner, Capt. Ira D. Rader, Capt. C. C. Chapman, Capt. H. A. Dargue, Capt. R. H. Willis, Capt. T. S. Bowen, Capt. E. S. Gorrell, Capt. A. R. Christie, Capt. T. S. Dodd, U.S.A.

Victor Carlstrom, three additional bars to Medal of Merit. He already held the following American records:—

(a) April 30th, 1916, one passenger, 16,225 ft.

(b) April 10th, 1916, two passengers, 11,180 ft.

(c) American Distance Cross-country Record: May 20th, 1916, one passenger, 283.02 miles, besides winning the Curtiss Marine Flying Trophy for 1916.

T. C. Macauley, three additional bars to Medal of Merit he already holds for:—American Distance—Closed Circuit Record: May 4th, 1916, five passengers, 154.08 miles. American seaplane Altitude Records: May 4th, 1916, five passengers, 775 ft., and April 30th, 1916, six passengers, 875 ft., and the American Seaplane Duration Record: May 4th, 1916, five passengers, 2 hrs. 23 mins.

* * *

It is reported from New York that Corpl. Victor Chapman, of New York, was killed in an air fight with the late Capt. Boelke, his machine falling in the German lines. It is said that Corpl. Chapman met Boelke while flying across country to get an orange for a wounded comrade who was in hospital.

* * *

Mr. J. Stanley Smith, an American, of Martinsdale, Montana, is the first aerial shepherd, writes the "Daily Express" New York correspondent.

Mr. Smith rides an aeroplane in looking after his large flocks of sheep, which number nearly 100,000, and states that he can cover five times as much territory in a day in an aeroplane as with the motor car which he formerly employed.

* * *

It is reported that Victor Carlstrom, the well-known American pilot, and an Army student aviator, were killed at Newport News, Virginia, on May 9th, their machine collapsing at a height of 3,500 ft.

Victor Carlstrom was one of the oldest and most consistent pilots in the United States. He acted as test pilot to the Curtiss Company for a lengthy period, and won many competitions and broke various American and world's records on their machines. His death will be a severe blow to American aviation.

* * *

Joy Field, near Detroit, owned by Henry B. Joy, has been offered through Sidney D. Waldon to the United States Government for aviation training. This field was inspected in 1915 by United States aviation officers, and a favourable report was made. The Packard Co. has been testing its aircraft motors out on this field, which is near Mount Clemens.

TWO SIDES OF A QUESTION.

At the London Munitions Tribunal on May 21st an Australian engineer and fitter was fined £2 for turning out an irregular aeroplane part. By a mistake the man cut a fitting a little too short, and, instead of making a new one, he welded a small piece on to the short one to make it the requisite length.

The manager said that had it not been accidentally detected it must have resulted in the death of any pilot who took up the aeroplane on which it was fitted. The defendant explained that it was merely an experiment to show that the plans were not properly drawn. He looked about for the foremen to tell them what he had done, but he could not find them, and next day he was too ill to attend the works.

THE LATE MR. ROWLAND DING.

Evidence at the inquest on the late Mr. W. Rowland Ding, who was killed on May 12th at Leeds, showed that he was killed instantly, and that the burning of the machine took place after it had struck the ground. No evidence could be produced to prove conclusively what actually happened.

Witnesses at the inquest paid tributes to his skill as a pilot and to his confidence in those who had the testing of the machine. The jury passed a resolution of sympathy with his wife and family.

Mr. Ding was 32 years of age, and was born at Alsager, Cheshire, his father being rector of the parish. He was educated at St. Edmund's Clergy School, Canterbury, and studied engineering at the Finsbury Technical College under Professor Silvanus Thompson. Later he was employed as an engineer in a colliery in Wales. After that he was in charge of an electric power station in the North of England. As noted last week, his first association with aviation was in partnership with Mr. W. H. Sayers. Subsequently he was employed by the Grahame-White Company, and for a time by the Royal Aircraft Factory, before starting the Northern Aircraft Co.

AIRCRAFT IN THE HOUSE.

On May 8th, Mr. G. Terrell (U., Chippenham) asked the Under Secretary for War whether, in view of the heroism displayed by the members of the Royal Flying Corps, he would arrange for reports of aerial engagements to be published in greater detail, together with the names of the officers and men distinguishing themselves therein.

Mr. Macpherson replied that the reports of contests in the air were supplied by the officers and men who had been engaged, and were remarkable for their brevity. In all such actions as were considered by the Commander-in-Chief to be worthy of reward the accounts were published, and it would be difficult to amplify them. In reply to the second part of the question, he reminded the hon. member that it had been previously pointed out by the Financial Secretary to the War Office that those actions which appealed most to the public were not necessarily the most commendable, and that only the Commander-in-Chief was in a position to decide in what cases the names of those participating in the actions should be made public. It was the expressed desire of the officers of the Royal Flying Corps that no public mention of individual names should be made.

[One ventures to congratulate the officers of the R.F.C. on their desire to avoid advertisement. Any tendency to "star" individual pilots would be distinctly unfair to equally heroic infantry officers whose lot is cast in less pleasant places when they are not actually fighting.]

One might, however, suggest that when a decoration or order is gazetted to an R.F.C. officer, the citation might mention the number of enemy aeroplanes which that officer is known to have brought down.—Ed.]

Mr. Terrell: Does the hon. gentleman consider that the reports published are the best and most descriptive that could be supplied, and that the suppression of the names of the gallant young men who take part in these engagements serves any useful military purpose?

Sir H. Dalziel (R., Kirkcaldy): Is the hon. gentleman aware that a young lieutenant of 20 has recently brought down 40 enemy machines, and has been personally congratulated by Field-Marshal Sir Douglas Haig, and that his name is not allowed to be mentioned?

No answer was given.

[But surely the congratulations of the G.O.C.-in-C. should suffice, except to overweening vanity.—Ed.]

Mr. Terrell: In view of the unsatisfactory reply of the Under Secretary for War, I beg to give notice that I will call attention to this matter on the motion for the adjournment to-morrow.

* * *

On May 9th, Mr. Bonar Law, speaking of the effectiveness of the recent fighting on the Western front, said:—

As regards the effectiveness of this fighting, I think it is a gratifying thing to feel that a very large part of the success was due to our superiority in artillery. It is indeed something of which, as a nation, we have a right to be proud, that in this branch of fighting we have a distinct superiority over our enemy—a superiority which is shown also in another direction. It is shown by our aviators, who are the eyes of our long-range guns. I have been told more than once that in France it is not uncommon to find regiments show their admiration for our aviators by cheering one of them as he flies low over their lines. That to me is not surprising. These men are all young, many of them are little more than boys, but from the beginning of this war they have shown a dash, a courage, a nerve-power, and a resourcefulness which entitle us to say that a more glorious fighting force has never existed in the world. (Cheers.)

[But with the better machines and engines which they could and should have had, there would have been less strain on their courage, nerve-power, and resourcefulness, so the credit should go entirely to the pilots and not to those who failed to supply them with the machines they should have had. And yet the latter are the people who get the credit and promotion.—Ed.]

Mr. G. Terrell (Chippenham, U.) drew attention to what he declared to be the insufficiency of publicity which was given by the military authorities to the gallant and glorious work which was being done from day to day by British aviators on the Western front. He quoted from the "Times" as follows:—"One very gallant feat was recently accomplished by one of our aviators. Flt. Sub-Lt. G." The article proceeded to describe what he did, and it was really a most extraordinary performance. But why should they not have "Flt. Sub-Lt. G.'s" name published?

[Because personal advertisement is bad form except among shop-keepers and politicians.—Ed.]

Mr. Macpherson said that in this matter attention must be paid to the views of the Royal Flying Corps itself. It had always been part of the Army, and our aviators felt that no special recognition or prominence should be given to them which would not be given to officers in the infantry and artillery. The best judge of any action peculiarly notable was the General Officer Commanding-in-Chief, and it ought to be left to him to say when special mention ought to be made. He thought the reason why the accounts of the brilliant combats in the air were so meagre



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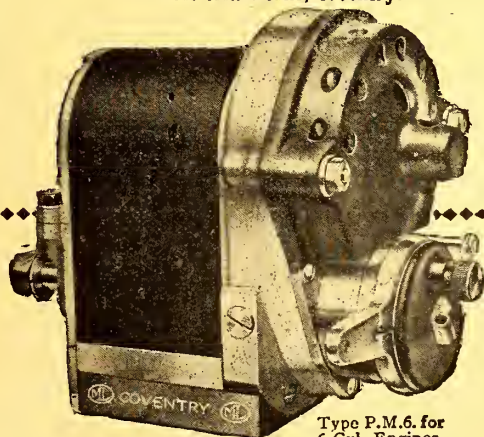
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was that the information was given by the aviators themselves, who did not try to enlarge upon the act of duty which they had performed. He would see whether fuller and equally accurate descriptions of fights in the air could not be obtained.

* * *

On May 10th **Dr. Macnamara** (Camberwell, N., L.) informed **Colonel Claude Lowther** (Cumberland, Eskdale, U.) that the British Navy was supplied with seaplanes capable of discharging torpedoes, and this method of attack was first employed with success in Aug., 1915, by Royal Naval Air Service pilots, who sank several enemy supply ships in the Dardanelles. Replying to **Mr. Pemberton-Billing**, **Dr. Macnamara** said:—The good work accomplished by the Royal Naval Air Service in locating and hunting enemy submarines is fully appreciated by the Admiralty, and receives frequent recognition. Full use is made of the seaplane squadrons by the senior naval officers in the various areas, and close co-operation with the patrol flotillas maintained.

[The word "full" is very elastic in its meaning.—Ed.]

Mr. Joynson Hicks asked whether since the Freiburg reprisal raid two further hospital ships have been torpedoed and a German aeroplane has killed civilians in London, and whether the Government intended to take instant and severe reprisals for these acts.

Mr. Bonar Law: The answer to the first part of the question is in the affirmative. With regard to the second part I regret I cannot make any statement.

* * *

On May 16th, **Dr. Macnamara** (Camberwell, N., L.), asked by **Mr. Billing** (Hertford, Ind.), whether the officers responsible for the policy which delayed a sustained naval and air offensive at Zeebrugge were those who were responsible for directing the recent bombardment of that enemy base, said:—The hon. member appears to be endeavouring to develop in the form of a question an argument based upon an entirely erroneous premise. It is incorrect to assume that there has been any change in the policy.

Mr. Billing inquired whether there had been any change in the command, and whether it had affected naval and air operations. **Dr. Macnamara**: It is incorrect to assume, as the hon. member now does again, that there has been any change in policy. **Mr. Billing**: I did not say in policy. Has there been any change in command? **Dr. Macnamara**: Not so far as I am aware. **Mr. Billing**: Is the Vice-Admiral the same? **Dr. Macnamara**: There has been no change so far as I am aware.

Mr. Houston (Liverpool, W. Toxteth, U.): Did not the late First Lord of the Admiralty state that nothing would induce him to approve of a naval bombardment of Zeebrugge? No reply was given.

Dr. Macnamara, answering an inquiry by **Colonel Lowther** (Eskdale, U.), whether the First Lord of the Admiralty would consider the immediate construction of a number of armed seaplanes, specially designed for flying in rough weather at a slow speed and low altitude, for the purpose of meeting incoming food ships within a given radius and conveying them into British ports, said:—We have already seaplanes which are capable of undertaking the work which my hon. and gallant friend suggests, and, in point of fact, have undertaken it as opportunity has arisen. **Mr. Billing**: Will the right hon. gentleman consider the advisability of having a regular system set up on regular trade routes of naval machines to meet incoming food ships, and not leave them to chance? **Dr. Macnamara**: I think the hon. member may very well leave it to those who have the work in hand.

[There is no doubt about the ability of a number of seaplanes to fly low and slowly. Some people wish they did not. One hopes that "those who have the work in hand" appreciate the possibilities of seaplanes rather better than did those who were supposed to have the work in hand in the past.—Ed.]

Mr. Macpherson (Ross and Cromarty, L.), replying to a question by **Mr. Billing** (Hertford, Ind.), about Captain Ball, D.S.O., Royal Flying Corps, said: I am sorry to say that the War Office has no further information about the fate of this gallant officer. It is not considered desirable to mention the type of machine which he was using.

Mr. Billing: Is it not a fact that this officer requested continually not to be forced to cross the line on this particular type of machine, that the 42 Germans he brought down were in nearly every case brought down by him when using a privately designed machine, and that the first time he was sent over on this other type he was lost?

Mr. Macpherson: I can scarcely believe that to be true. I know that that gallant officer never questioned any order that was given. (Cries of "Oh!")

Sir H. Dalziel (Kirkcaldy Burghs, L.): Is there any ground for hoping he is still alive? **Mr. Macpherson**: We hope he is.

Mr. Pringle (Lanarkshire, N.W., L.): Will the Government make inquiries into the allegation put forward?

Admiral of the Fleet Sir H. Meux (Portsmouth, U.): If this gallant officer would not refuse to obey any order would it not

be a reason for being careful not to give him a bad order? **Mr. Macpherson**: No complaint has ever been made of his having received a bad order. **Admiral of the Fleet Sir H. Meux**: The hon. member (**Mr. Billing**) has made a complaint.

Mr. Pemberton-Billing asked the Prime Minister whether it was proposed to include in the new Air Committee, formed to consider the development of our Air Services for mail and commercial purposes after the war, representatives from recognised aeronautical and commercial institutions; and, if so, what steps were being taken to this end.

Major Baird: The Prime Minister has asked me to answer this question. The composition of this committee, which will be announced at an early date, will, I think, be found to be fully representative for the purpose of considering, in all their aspects, the questions involved in the reference.

FROM DENMARK.

THE AEROPLANE'S Danish correspondent writes:—

The well-known French biplane looper and exhibition aviator Chevillard has been transferred to a Swiss internment camp in Interlaken.

The later German casualty lists of the flying services contain among others the following names:—**Flt. Lt. Karl Heinz Bernius**, died from wounds of an accident by a cross-country flight; fighting aviator **Lt. Hans Imelmann**, of the "Jagdstaffel" Boelcke, killed in aerial fight behind the hostile lines in the age of 19 years; **Flt. Lt. Gustav Leffers**, awarded the "Pour le Mérite," killed in aerial engagement on December 27th, 1916; **Lt. Count Karl zu Königsegg-Aulendorf**, killed; Army Field-aviator **Hans Joachim von Arnim**, killed; **First Lt. of the Navy Hans Röthig**, killed; **Flt. Lts. Fahlbusch**, pilot, and **Rosenbrantz**, observer, killed in aerial fight; Officer Replacer **Alfred Zechmann**, killed.

Gustav Tweer, killed in accident on a cross-country flight, was Germany's first looping pilot on a Grade monoplane equipped with landing chassis both above and below the planes, and on a Blériot, model Pégoud. He had served on the Russian theatre of war, and an obituary on him contains an attack on the English looper **Thornely**, "who had been engaged by the Münster Aero Club during the Prince Henry Flight for exhibition flights, but failed and drove off in an auto furious, while Tweer thrilled the spectators."

Lt. Eugen Müller, killed; **Lt. Gunther Doerrien**, killed; **Dr. Engineer Euard Heller**, killed together with his pilot, **Captain von Scanzoni**, in a cross-country flight to the Deutsche Versuchsanstalt für Luftfahrt, where he did scientific work.

A further fatal accident from experimental aviation work is the fall of **Hans Vollmöller**, of which the following particulars are now available, that he was testing an aeroplane of the Staaken aircraft works in Spandau (for experimental giant aeroplanes) and his passenger was killed too, being the director of the work for the time of the war, **Director Klein** of the Bosch Magneto Co., who had rendered services to Count Zeppelin's work and to whom Robert Bosch largely attributes the successes of the magneto company.

* * *

The Danish correspondent now sends the published German list of 58 captured Allied aircraft, reading:—

The German headquarters reports claimed the losses of 102 aeroplanes to the British and French Air Services during October last, and thus:—58 captured, comprising 37 English and 21 French, 42 shot reliable down in the hostile lines and 2 forced to land in the ground of the enemy.

British aeroplanes:—

1. Sopwith biplane; Nr. 9658; motor Clerget, Nr. 239; the names of the passengers could be ascertained no more.
2. B.E. biplane; Nr. 4190; engine ?; the names of the passengers could be ascertained no more, as they were burned.
3. B.E. biplane; Nr. 4494; motor Renault. Passengers: **Caspar Kennard**, **Ben Cyrill Digby**, 16th Squadron.
4. Sopwith biplane; Nr. 382; engine Clerget, Nr. 253. Pilot, **Lieut. F. M. Lawlede**.
5. F.E. biplane; Nr. 1757; motor Gnome, Nr. 6131; the rudder numbered A2540. The names of the passengers could be ascertained no more.
6. Vickers biplane; Nr. ?; motor Daimler, Nr. 7105/29229. Passengers: killed; their names could be ascertained no more. The aeroplane was armed with two Lewis guns, Nr. 14029 and 1101.
7. F.E. biplane; Nr. ?; engine Daimler, Nr. 730. Passengers: **First Lieut. Copland**, **Lieut. Heyne**, 25th Squadron.
8. Breguet biplane; Nr. 9176; motor Renault, Nr. 54281. Passengers: **First Lieut. Neumann**, **Corporal Vitty**.
9. Sopwith biplane; Nr. 9660; engine Clerget, Nr. 260. Pilot: **Sub-Lieut. Charles Hampton Butterworth**.
10. Breguet biplane; Nr. ?; motor Renault, Nr. 54777. Passengers: **Lieut. Rockey**, **Sergeant Sterdec**.
11. Morane-Saulnier monoplane; Nr. 783; motor Le Rhone, Nr. 3942. Passengers: **Lieut. Charles Kelly**, **Lieut. Sturrock**.
12. B.E. biplane; Nr. 7107; engine Renault, Nr. ? Passengers: **Lieut. Archibald Douglas**, **Corporal Valentin Hugill**.



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QUOTATIONS WITH SAMPLES BY RETURN.

13. Vickers biplane; Nr. ?; motor ? The names of the passengers could be ascertained no more. Shot down on Oct. 16th to north-east of Beaulencourt.

14. B.E. biplane; Nr. 6580; engine Daimler, Nr. 25188. Passengers: Lieut. Thompson, Lieut. Capper.

15. F.E. biplane; Nr. 6346; motor Beardmore, Nr. 271. Passengers: Crisp, Harding.

16. B.E. biplane; Nr. ?; motor ?. As the aeroplane was burned, the names of the passengers could be ascertained no more. Shot down on Oct. 16th by Ytres.

17. F.E. biplane; Nr. ?; motor ?. The names of the passengers could be ascertained no more. Shot down on Oct. 17th by Combles.

18. Vickers biplane; Nr. ?; engine Daimler Nr. 7075. Passengers: C. Clayton; the name of the second could not be ascertained.

19. Morane-Saulnier monoplane; Nr. ?; motor Le Rhone, ? Passengers: Lieut. Ellis; the name of the second could be ascertained no more.

20. F.E. biplane; Nr. ?; motor ?. Passengers: killed; their names could be ascertained no more. Shot down on Oct. 17th by Tilloy.

21. Type, ?; two engines, Beardmore Nr. 458 and 2430. Passengers: Sub-Lieut. Dingley, Sub-Lieut. Whitehead, 18th Squadron.

22. B.E. biplane; Nr. 6180; motor Siddeley-Deasy, Nr. 491. Passengers: killed, their names could be ascertained no more.

23. Vickers biplane; Nr. ?; engine ?. Passengers: killed, their names could be ascertained no more. Shot down on Oct. 20th by Grevillers.

24. Vickers biplane; Nr. 4867; motor Beardmore, No. 636. Passengers: Lieut. Black, Lieut. de Pommery, 11th Squadron.

25. Morane-Saulnier monoplane; Nr. 932; motor Le Rhone, Nr. ?. Passengers: Lodz, Sub-Lieut. Genay.

26. B.E. biplane; Nr. 2546; engine Anstin (Austin?), Nr. 1352. Passengers: killed, their names could be ascertained no more.

27. B.E. biplane; Nr. 7786; motor Ruston, Nr. 1046. Passengers: Lieut. Fullerton, Sergeant Snowden.

28. Vickers biplane; Nr. 1586; motor Gnome, Nr. 30388. Pilot: Sub-Lieut. Holtom.

29. B.E. biplane; Nr. ?; engine ?. The names of the passengers could be ascertained no more. Shot down on Oct. 22nd by Grevillerswald.

30. Sopwith biplane; Nr. ?; motor ?. Passengers: killed, their names could be ascertained no more. Shot down on Oct. 22nd by Beaulencourt.

31. Vickers biplane; Nr. 7684; motor Beardmore, Nr. 740. The names of the passengers could be ascertained no more.

32. B.E. biplane; Nr. 2524; motor ?. The aeroplane burned down. Passengers: killed, their names could be ascertained no more.

33. B.E. biplane; Nr. ?; engine ?. The aeroplane exploded in the air and burned completely. The names of the passengers could be ascertained no more.

34. Vickers biplane; Nr. ?; motor ?. The aeroplane was smashed completely. The names of the passengers could be ascertained no more. Shot down on Oct. 26th to north-west of Le Transloy.

35. B.E. biplane; Nr. 6629; motor ?. The names of the passengers could be ascertained no more.

36. Nieuport biplane; Nr. ?; motor Le Rhone, Nr. 133. Pilot: William Mackay Carlyle.

37. Type and passengers could be ascertained no more. Shot down on Oct. 31st by Warlencourt.

French aeroplanes:—

1. Nieuport biplane; Nr. ?; motor ?. The name of the pilot could be ascertained no more. Shot down on Oct. 7th, at 3 o'clock in the afternoon, East of Morval.

2. Nieuport biplane; Nr. 1596; motor Le Rhone, Nr. ?. Passengers: Lieut. Billon, Sergeant Thuan.

3. Breguet biplane, numbered B.M. IV 221; engine Renault, Nr. ?. Passengers: Sergeant Bonet, Private Delcroix.

4. Breguet biplane, numbered B.M. IV 229; motor ?. Passengers: Sergeant Barlet, Bombardier Luneau.

5. Breguet biplane; Nr. B.538; motor Renault, Nr. 49501. Passengers: Robert de Montais, Andrée Haas.

6. Breguet biplane; Nr. 436; motor Renault, Nr. 358. Passengers: Sergeant Leon Mattay, Private Marchand.

7. Farman biplane; Nr. ?; engine Renault, Nr. 54394. Passengers: Adjutant Baron, Sergeant Guérineau.

8. Farman biplane; Nr. ?; motor Renault, Nr. 55469. Passengers: Georges Armand, Jouan Desiré.

9. Caudron biplane; Nr. 2711; motor Le Rhone, Nr. 739. Passengers: killed, their names could be ascertained no more.

10. Nieuport biplane; Nr. 1438; motor Le Rhone, Nr. 4107. Pilot: killed, his name could be ascertained no more.

11. Aeroplane, type and motor to be ascertained no more. Specification: Charge Maxila m. V.933. Type XXI.

12. Nieuport biplane; Nr. ?; motor ?. Pilot: Adjutant Louis Page.

13. Caudron biplane; Nr. 1337; engine Le Rhone C. 1547. The names of the passengers could be ascertained no more.

14. Nieuport biplane; Nr. ?; motor ?. The name of the pilot could be ascertained no more. Shot down on Oct. 23rd by Azannes.

15. Nieuport biplane; Nr. ?; motor Gnome, D.N.Q. 795. H. & C.S.F.A. The name of the pilot could be ascertained no more. Shot down on Oct. 23rd by Azannes.

16. Nieuport biplane; Nr. 1851; engine Le Rhone, Nr. 3962. Pilot: Lieut. Josef Maria, Escadrille 77.

17. Caudron biplane; Nr. 2073; motors, two Le Rhone, Nr. 685 and 413. Passengers: Lieut. Albert de Blanc, Corporal Camille Fennegoud, Escadrille 56.

18. Nieuport biplane; Nr. ?; motor ?. The aeroplane completely smashed. The names of the passengers could be ascertained no more. Shot down on Oct. 25th at Herbebois.

19. Farman biplane; Nr. 2746; motor Renault, Nr. 57143. Passengers: Captain Gouilhaumon, Lieut. Rousch.

20. Caudron biplane; Nr. 1184; motors, two Le Rhone, Nr. 614 and 392. Passengers: Sub. Lieut. Ressaynier, Sergeant de Sars, Escadrille C. 207.

21. Caudron biplane; Nr. 3080; motors, two Le Rhone, Nr. 2437 and 1336. Passengers: Lieut. Dupont, Sub-Lieut. Maurice Choissy, Escadrille 104. * * *

The German February list of captured Allied aircraft on the Western Theatre of War is as follows:—

BRITISH AERoplanes.

1. Vickers; Nr. A2614; motor Gnome. Passenger: Capt. A. G. V. Daly.

2. Vickers; Nr. A28; motor Rolls-Royce. Passengers: Capt. Carbert, Lieut. Spicer.

3. Vickers; Nr. A1951; motor Rolls-Royce. Passengers: Lieut. Reeves, Lieut. H. F. Bronskyll.

4. Vickers; Nr. 7705; motor unascertainable. Passengers: Lieut. Whitney, Lieut. Holley.

5. Vickers; Nr. ?; motor destroyed by artillery. The pilot is in the field hospital at Croiselles.

6. Vickers; Nr. A38; motor Rolls-Royce. Passengers: Lieut. Woods, Lieut. Maule.

7. Vickers; Nr. A3; motor Rolls-Royce. Passengers: Lieut. John J. Gibbon, Lieut. Thomas Ch. Lucas.

8. Vickers; Nr. 7932; motor Le Rhône. Passenger: First Lieut. C. H. March.

9. Vickers; Nr. ?; motor ?. The pilot killed.

10. Sopwith; Nr. 5191; motor Le Rhône. Passenger: Sub-Lieut. Traynor.

11. Sopwith; Nr. 7789; motor Clerget. Passengers: Lieut. Edward Erlebach, Sub-Officer Ridgway.

12. Sopwith; Nr. A642; motor Le Rhône. Passenger: Sec. Lieut. Fairbairn.

13. Sopwith; Nr. A654; motor C.W.D. Passenger; Capt. C. L. M. Scott.

14. Sopwith; Nr. ?; motor ? The passengers mortally wounded.

15. Sopwith; No. 9739; motor Clerget. Passengers: Sub-Lieut. Lewis Smith, Richard Stretton.

16. B.E.; Nr. 6742; motor ? Passengers: Lieut. Murray, Lieut. McBar.

17. B.E.; Nr. ?; motor ? The officer killed; the second passenger not found.

18. B.E.; Nr. 6231; motor ? Passengers: Lieut. H. A. Croft, Lieut. Bonnet.

19. B.E.; Nr. 4179; motor ? Passengers: Lieut. Munn, Lieut. Lindley.

20. Farman; Nr. ?; motor Renault. Passengers: Lieut. Berger, observer; the second passenger could not be ascertained.

21. Nieuport; No. 6622; motor Le Rhône. Passenger: Lieut. J. M. E. Shepherd.

FRENCH AVIONS.

1. Nieuport; Nr. 7173; motor Le Rhône. Passenger: Lieut. Georg Mandar.

2. Nieuport; Nr. 2405; motor Le Rhône. Passenger: Corporal M. Daubert.

3. Nieuport; Nr. 2328; motor Le Rhône. Passenger killed; no papers.

4. Nieuport; Nr. 2183; motor Le Rhône. Passenger: Corporal Maurice Girard.

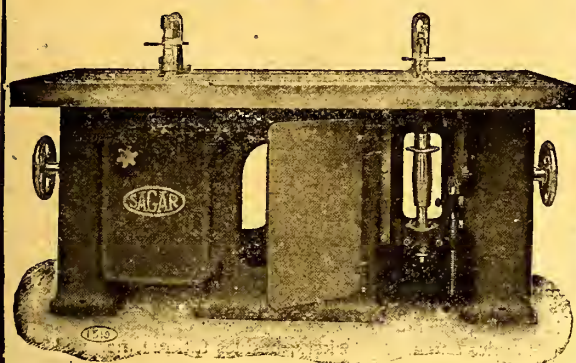
5. Nieuport; Nr. 2409; motor Le Rhône. Passenger: Corporal Rivière Maurice.

6. Nieuport; Nr. 1468; motor Salmson. Passengers: Marechal des Logis Edmond Libeyre, Sergeant Jean Laserre.

7. Voisin; Nr. 1800; motor Peugeot. Passenger: Marechal des Logis Villebonne.

8. Voisin; Nr. C.V.; motor Salmson. Passengers: Adjutant Georges Driot, Sergeant Georges Flint.

9. Farman; Nr. 2536; motor ? Passengers: Sub-Lieut. Lattion, Corporal Fougerot.



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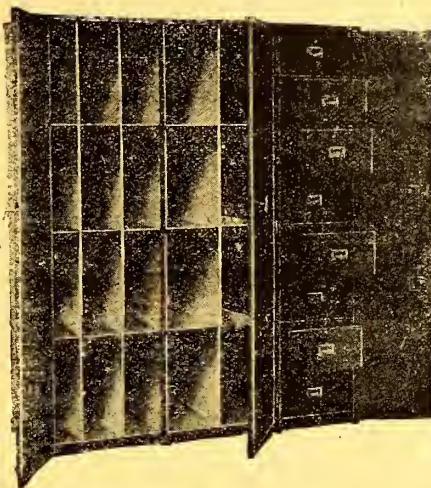
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WHEN CORRESPONDING WITH ADVERTISERS



On the Eastern and Southern Theatres of War.

BRITISH AEROPLANES.

1. A.W.; Nr. 6196 or 6197; motor Renault E775. Passenger: Major Black.
2. A.W. type; Nr. 6219; motor Armstrong, the Lanchester Motor, Ltd., Birmingham, 1710. Passenger, name unknown.
3. B.E. (single-seater); Nr. 5289; motor Deasy 4439. Passenger: Captain Owen.

FRENCH AVIONS.

1. Farman; Nr. not known; motor De Dion Bouton. Passengers: Lieut. (name not known); Sub-Officer Meier.
2. Farman; Nr. 12; motor De Dion, 27708. Passenger: Private Raoul Delpiece.
3. Nieuport; Nr. 327/16; motor (name not given) 775. Passenger: Sub-Officer Franz Lemich.
4. Nieuport (single-seater); Nr. ?; motor, Specification not known. Passenger: ?

ANOTHER VIEW OF AMERICA'S OPPORTUNITY.

BY PERCY NOEL.

PARIS, April 26th, 1917.—The greatest immediate aid that the United States can lend France in the air would be the preliminary training of pilots. This opinion is unanimous among officers of the Flying Service. An authority, who is probably better qualified than any other man in France to understand the possibilities, states that combining prompt and efficient organisation with her vast facilities the United States should be able to train 2,000 pilots in the next six months. After that the number of pilots producible could attain the figures of 2,000 monthly, provided a sufficient number of pupils could be recruited. That would mean 8,000 pilots the first year. My authority, who has always insisted that the war would be won in the air, believes that 2,000 additional pilots in France this autumn would do much to assure an early victory.

It is not suggested that the pilots should complete their training in America, but that the instruction of pupils be carried to the point where they pass the French tests for the military pilot's brevet. After which, they would be ready to come to France and take the finishing courses on whatever type of machine to which they were assigned. The finishing course would require from two to four months, according to the air work for which the pilots were trained, and the natural ability of the man.

"At the end of the first six months," he said, "America could be expected to produce aeroplanes equally as efficient as the new types that are being ordered by the French Army at the present time, if not better machines eventually; but our great need is for pilots. France will be able to supply aeroplanes for as many pilots as the United States can send to her."

"Without losing time in experimentation, with new types of aeroplanes and motors, or in copying the most successful European products, which may be out of date by the time they are built and shipped across the sea, American constructors can speedily furnish excellent machines for training purposes. If these training machines are of varied types, but all fitted with the same system of control adopted by the French and English, it will be an advantage. Training on different types of aeroplanes brings out the different qualities in pilots that are needed to qualify for the several branches of war flying."

"A well-organised air school to accommodate five hundred pupil pilots simultaneously should be provided with three hundred aeroplanes so that a minimum of one hundred machines will be always available for use. A school personnel of about seven hundred is needed, including sixty instructors or monitors, four hundred mechanics and woodworkers, besides fatigue men and guards. Counting the first month as practically lost in organisation, such a school could graduate four hundred pilots at the end of the third month. These pilots would then be ready to come to France for the finishing courses."

"If present American civilian and army pilots should be required for other tasks three score French airmen could certainly be spared for a few months in the United States. Their temporary absence on such a mission would be nothing compared with the results that would probably follow. After a few months they could be largely replaced by the most apt of the new American pilots. Other great aviation schools could be established at the end of the first six months, and the production of the aviators carried to a point of numbers that American imagination can readily conceive."

"For the school to be efficient the grounds must be well chosen. Climate is the first consideration. Although a vast plain where high wind velocity is frequent has its weakness, wind is less of a deterrent than mist, rain and clouds. The ideal schooling ground is a wide valley where six or eight square miles of ground is available, and the climate provides even temperatures. Even if it is hot during the day, training can be done in the early morning hours and the evening. It should be a sequestered spot, not far from a railway line nor near a large city. The pupils should have no opportunity to think of anything but aviation in the first months of training."

"I allowed two months for training, and eighty per cent. success, that is, 400 pilots out of every 500 pupils. The estimate is lower than the average result in France. Many pilots have flown the severe tests for their brevet successfully after one month's training. A half-hour in the air five days out of the week, making allowance for bad weather, would give the pupil fifteen hours' flying monthly. Each monitor having ten pupils would thus be teaching on an average of five hours daily. But when the pupil is far enough advanced to fly alone, two or more pupils, under each monitor, can be in the air simultaneously, and thus he can double the time of instruction daily, and the pupil can average an hour a day in the air, five days of the week, or thirty hours a month. That is why some pilots qualify after a month's training. These are, of course, all minimum figures."

"I do not suppose that the recent losses in the glorious American or 'Lafayette' escadrille will dampen the ardour of young Americans who have thought of flying for their country, and the great cause of humanity, but will rather accelerate recruitment for aviation if the applicants know that they are going to France to avenge their dead countrymen. However, it must be con-

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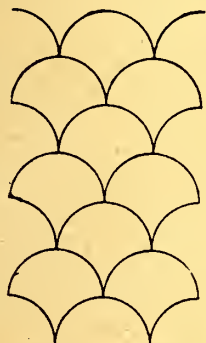
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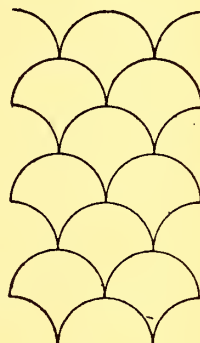
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sidered that the American escadrille is engaged in the most hazardous phase of war aviation, which is chase. It is their duty to hunt and chase the fastest and most powerfully armed aeroplanes of the enemy, and to guard the pilots of all the other branches of our Service. Although there is always need for more chasing pilots of the courage that American aviators have shown, more pilots are required in other work where they are less exposed to danger, but none less important and heroic."

It should be noted that this plan applies only to the American Army; it is understood that the Navy will make every effort to increase its air forces for coast defence and all-home Service.

[By a curious coincidence this article arrived from Mr. Percy Noel in Paris on the day on which THE AEROPLANE's article on "America's Opportunity" was published. Mr. Noel deals with a slightly different aspect of the question, but it will be noticed that he agrees entirely with the view that America can train pilots quickly, and can supply numerous fighting pilots long before she can send an Army to Europe.—Ed.]

METEOROLOGY AND NAVIGATION.

The above was the subject of the Aeronautical Society's lecture at St. Peter's Hall, Cricklewood, on the 3rd instant.

The lecturer was Professor W. G. Duffield, D.Sc., of University College, Reading, the chair being taken by Mr. H. Handford.

Professor Duffield, who is attached to the R.F.C. for instructional purpose, gave an exceptionally clear and concise lecture on the effect on aircraft of various meteorological conditions.

After explaining, with the aid of models, the action of the various instruments used in this connection, he went on to show the deductions it was possible to arrive at by observation of various cloud formations in conjunction with barometric readings and how necessary it was for pilots to be *au fait* with this part of meteorology.

Some very fine cloud studies were projected on to the screen to illustrate this portion of Professor Duffield's lecture, and the audience were much amused at the lecturer's anecdote of the old lady who, on hearing that the Zeppelins usually flew above the clouds, suggested to the authorities that they should take steps to freeze the clouds and mount anti-aircraft guns on them.

The audience were intensely interested in the lecturer's explanation of the method of preparing weather charts and forecasts, and one could fully appreciate of what immense value these charts must be to aviators.

It was altogether a very fine lecture, and, though the audience was not so large as might be desired, those who were present testified to their appreciation by an extremely warm response to the vote of thanks proposed by the chairman.

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Raphael Tuck and Sons, Ltd., have produced a series of picture postcards in their well-known "Oilette" style, of a modern aeroplane executing six different evolutions. The pictures are tasteful reproductions from paintings by Mr. G. T. Clarkson, and readers who fancy something rather out of the usual in correspondence cards are recommended to investigate the matter. The series number is 3101, and the cards may be obtained from any stationers. Incidentally, Mr. Clarkson is an Air Mechanic in the Royal Flying Corps, and is, therefore, well qualified to depict aeronautical scenes with accuracy.

PRESENTATION AEROPLANES.

The Government of the Gold Coast has received from the Aborigines Rights Protection Society a further sum of £1,500, which has been subscribed locally for the purchase of a second aeroplane to be presented to the Royal Flying Corps.

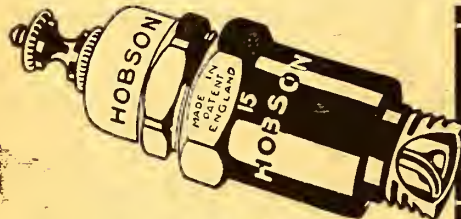
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"DOPE."

The latest literary effort to appear from the midst of the war is a production called "Dope," which is the "Unofficial Organ" of No. 4 Wing R.N.A.S., on active service. It contrives to be extremely funny without being vulgar, albeit one imagines that some of its allusions are distinctly rude to those to whom they refer. Incidentally it contains one compliment at least, in that "Dope" announces that it "Will Cellon Its Merits," an allusion of which Mr. Wallace Barr, of Cellon, Ltd., doubtless feels duly proud. One wishes the latest addition to aviatric reading every success. Its life may be short, if it is only to be for the duration of the war, but it will certainly be a gay one.



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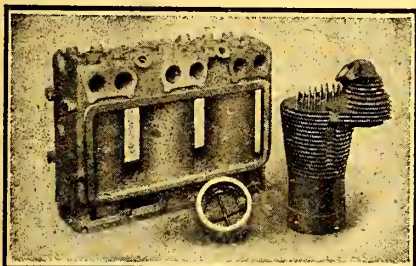
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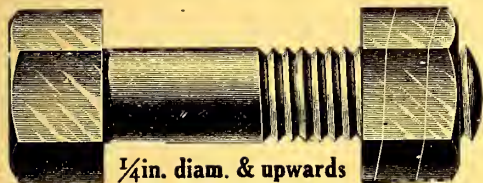
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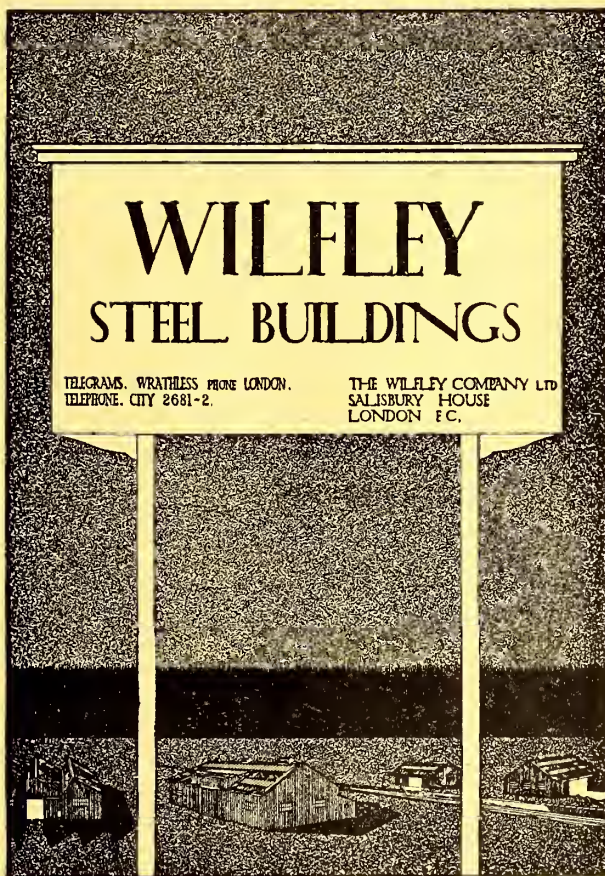
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On account of the labour involved in replying to questions from correspondents, many of which in the past have been answered over and over again by post, it has been decided to answer inquiries of general interest in the columns of THE AEROPLANE. Inquiries should be addressed to The Editor, 166, Piccadilly, W.

READERS BY THE HUNDRED.—If you want any information about joining the R.F.C., write to the Director-General of Military Aeronautics, Adastral House, Blackfriars, E.C.

If you want any information about joining the R.N.A.S., write to the Air Department, The Admiralty, Whitehall, S.W.

W. S. (Hendon).—I am afraid I can give you no information about the B.E.2b. biplane, as it would be contrary to the Defence of the Realm Act to do so.

The Wolsley Motor Co., Ltd., of Adderley Park, Birmingham, published a very interesting hand-book on the Wolsley-Renault engine, the price of which is 2s. 6d. Copies may be obtained direct from the company.

A. J. M. (Dover).—Special covers are not sold in which to bind THE AEROPLANE. Any bookbinder will do the necessary work at a small charge.

W. A. R. W. (Weybridge).—I do not know an aeroplane carrying the initials F.B., except, perhaps, the F.B.A., which is the Franco-British Aviation Company's flying boat. B.E., as you suggest, stands either for Blériot Experimental or British Experimental. The first interpretation was given in the earlier days, but later on the type was known as British Experimental. It is no State secret to tell you that the B.E. and R.E. aeroplanes are tractor biplanes; the R.E. being a comparatively large machine. The F.E. is a pusher biplane. It is quite impossible to answer your last question as that would involve a breach of the regulation regarding communicating information of value to the enemy.

J. H. McK. (Legrave).—I am afraid no book exists on the design and construction of aircraft in relation to draughtsmanship. I think if you buy "The Aeroplane Speaks," by Captain H. Barber (7s., post free), and "Aeroplane Design," by Captain F. S. Barnwell, R.F.C. (2s. 9d., post free), you will get a pretty good insight into aeroplane principles and some notion as to the details which come within the purview of the Drawing Office. These books may be obtained from the William Dawson Publishing Co., Ltd., Rolls House, Breams Buildings, E.C.4.

W. R. L. (Galleywood).—R.F.C. Cadets receive privates' pay while in training and uniform allowance, which is sufficient to cover the cost of the necessary kit.

W. L. (Derby).—Undoubtedly the best book dealing with aviation from a general point of view is "The Aeroplane Speaks," by Captain H. Barber, price 7s., post free, from the William Dawson Publishing Co., Ltd., Rolls House, Breams Buildings, E.C.4. A cheap book on aeroplane design and stability is "Aeroplane Design," by Captain F. S. Barnwell, R.F.C., which contains an essay on stability by Lieut W. H. Sayers, R.N.V.R. As regards engines, you should buy "Aeronautical Engines," by F. J. Kean, price 6s.

Specific gravity is the ratio between the weight of a given volume of water and the weight of any other substance displacing that volume of water. That is to say, specific gravity of water is expressed by the figure 1. As a cubic foot of petrol weighs 0.73 of a cubic foot of water, the specific gravity of petrol is spoken of as 0.73. This figure is only approximate, as naturally the various grades of petrol have varying specific gravities.

CPL. F. J. C. (S. Kensington).—It would, of course, be impossible for you to obtain a commission in either the R.N.A.S. or the R.F.C. as a pilot, as naturally only men of the best physique are taken for this work. There are certain ground jobs in both Services, such as Stores Officer, R.N.A.S., and Equipment Officer, R.F.C., but as the work which they have to do is at times of a very strenuous nature, and as they have to be prepared to go to any country between the North Pole and the Equator to which their squadron happens to be sent, I do not think a man with a weak heart would be accepted under any circumstances. It might, however, be worth your while to apply for an appointment as Equipment Officer, R.F.C.; that is, assuming you have a certain amount of mechanical knowledge. If not, I am afraid you have no chance. In any case, application must be made through your own commanding officer, and he must apply with due form and ceremony for your transfer. It is quite hopeless to attempt to do anything on your own, and if you made an attempt you would get into trouble for doing so.

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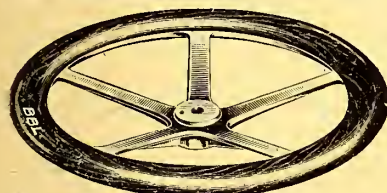
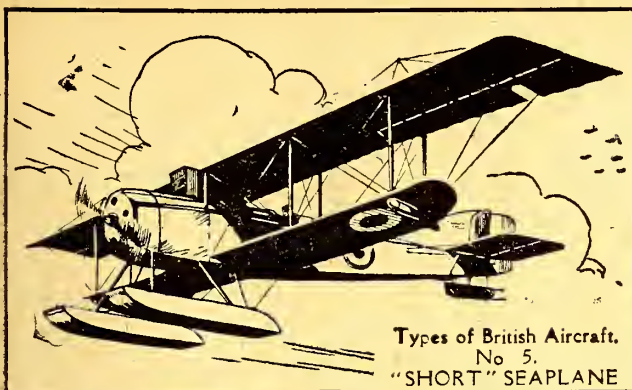
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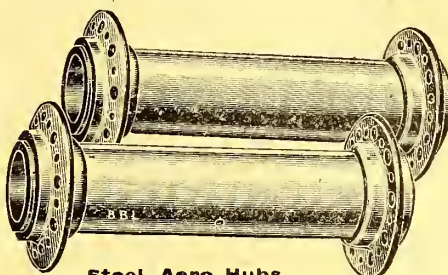
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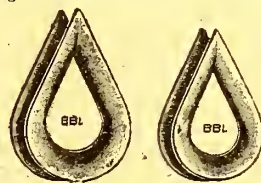
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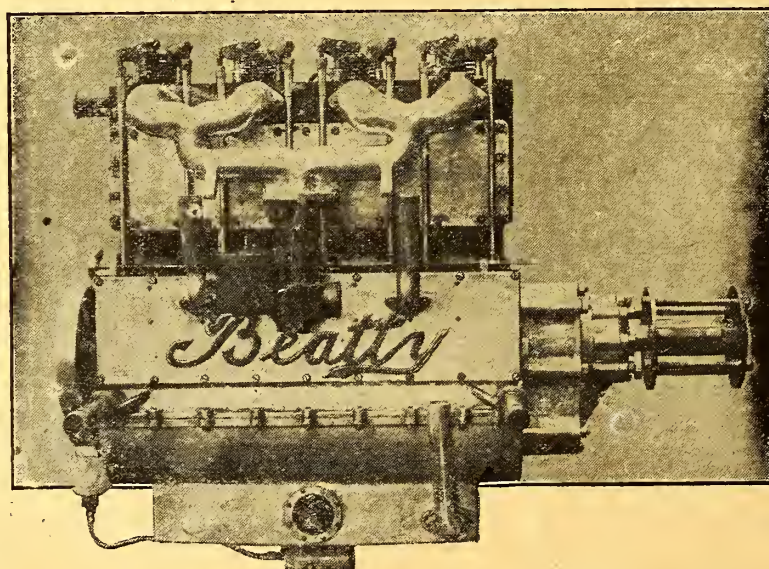


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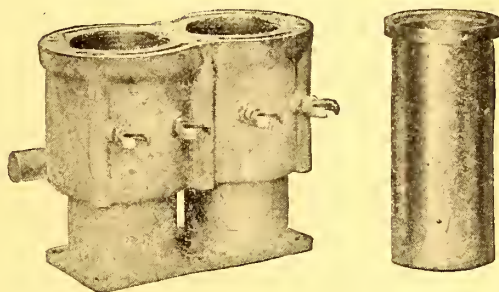
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ON THE CIVIL AERIAL TRANSPORT COMMITTEE.

The Civil Aerial Transport Committee, whose composition was announced by Major Baird, M.P., in the House of Commons on May 23rd, undoubtedly contains much potentiality for good, so long as it maintains its independence of action and does not permit itself to be used as a means of creating after the war a Government monopoly of aircraft use—which would mean a Government monopoly of aircraft design and construction, and consequently still more hindrance to progress. The composition of the Committee may best be described as heterogeneous, for though there seems to be a very large proportion of purely Governmental nominees there are enough men of proved independence and originality of thought to leaven the lump.

As the notes so far published in the daily Press on the members of the Committee have been so inaccurate or inadequate, it seems well to give further particulars:

LORD NORTHCLIFFE (CHAIRMAN).—Proprietor of the "Times," "Daily Mail," and numerous other publications. Was the first newspaper proprietor to grasp the possibilities of aviation, and has given large sums in prizes in the endeavour to advertise flying among the British Public. During the war he has used his newspapers to support the various agitations for adequate aircraft equipment, and has thus been of material assistance to the Flying Services.

MAJOR BAIRD, M.P. (DEPUTY CHAIRMAN).—Recently nominated to reply for the Air Board to criticisms in the House of Commons. Is not known to have been interested in aviation previously, but has endeavoured to inform himself on the subject in the short time available. Is said to have qualified for his Aviator's Certificate, and has done a good deal of cross-country flying as a passenger. Has, apparently, implicit faith in Official Designers, and has still a great deal to learn about flying, both historically and technically.

THE DUKE OF ATHOLL.—Chairman of the Royal Aero Club. As Marquess of Tullibardine was interested in the early experiments with the inherently stable Dunne aeroplane at Blair Atholl, and was the chief financial support of the Blair Atholl Aeroplane Syndicate, which was formed to develop the knowledge of inherent stability long before the existence of that quality was discovered by Government officials. Has been a highly valued supporter of aviation in general for many years, and has flown as a passenger, but one can hardly support the statement in the "Times" that "he has had actual experience as an airman."

COLONEL LORD MONTAGU.—One of the earliest supporters of aviation in this country, and possesses foresight concerning the development of aviation amounting almost to the gift of prophecy, as shown by his speeches in the House of Lords so far back as 1909. Rendered highly valuable service to the Empire during the agita-

tions for adequate aerial forces early in 1916, by his outspoken and well-informed criticism, and especially by his resignation from the "Derby Committee" as a protest against its impotence. As a Peer of the Realm his criticism impressed on the British Public the fact that similar criticisms by mere commoners were not mere vulgar agitation. Does not profess to be a practical aviator, not being a pilot, so the "Times" scarcely seems correct in describing him as "one of the leading experts on questions of airmanship."

LORD SYDENHAM, G.C.S.I.—As Sir George Sydenham Clarke earned the reputation of being one of the most distinguished soldiers and administrators of the Empire. A firm believer in the possibilities of aircraft, and as one of the leading authorities on Military Science as well as on Colonial Administration is particularly worthy of trust and consultation where the employment of aircraft by Governments is concerned. Is a man of high principles, and has the courage of his convictions, as was shown by his resignation from the previous Air Board as a protest against its lack of executive power. Should have occupied an important position in the present Air Board.

MR. BALFOUR BROWNE, K.C.—A distinguished lawyer, an authority on patents, an amiable gentleman, and a member of the Government Enquiry Committee which in 1916 endorsed so many criticisms of the Administration of the Royal Flying Corps.

MR. A. E. BERRIMAN.—Formerly an aeronautical and motor journalist and writer. A clever mathematician. At present technical adviser on aeroplane and aero-engine construction to the Daimler Motor Car Company of Coventry.

MR. G. B. COCKBURN.—One of the pioneers of British Aviation. Was the only British competitor at the great aviation meeting at Reims in 1909, where he flew the first Farman biplane ever built. Continued thereafter to experiment at his own expense on Salisbury Plain. In 1911 devoted some six months of his time, entirely at his own cost, to teaching flying to the first four officers permitted to fly officially by the Admiralty on Short biplanes lent free of charge by Mr. Frank McClean. [NOTE.—So far as can be gathered, neither Mr. Cockburn nor Mr. McClean ever received even so much as a letter of thanks from their Lordships of the Admiralty for their patriotic generosity.]

Later, when the Aeronautical Inspection Department R.F.C. was formed under the late Lieut.-Col. Fulton, C.B., his close friend, Mr. Cockburn, at his urgent request, joined him as inspector of aeroplanes, which onerous duties he has continued to carry out ever since with marked ability and moral courage. On every aspect of aviation Mr. Cockburn's views are of the

highest value, and his appointment to this committee is a singularly happy selection.

MR. G. HOLT THOMAS.—With the exception, perhaps, of the late Sir George White, was the only business man to have faith in the commercial future of aircraft in the earliest days. Did much to impress this country with the possibilities of flying by introducing the best French engines and aeroplanes and pilots. Set up the beginnings of his present vast concern, the Aircraft Mfg. Co., Ltd., at a time when every official discouragement was given to British pioneers.

Is now head of the biggest aircraft and aero-engine combination in the world, as the result of his foresight. Possesses unlimited faith in the future of aerial transport, and possesses the mental capacity and organising ability to make his faith a business asset.

MR. CLAUDE JOHNSON.—Managing Director of the Rolls-Royce Motor Car Company, who have recently produced a highly successful aero-engine as the result of that Government encouragement which purely aero-engine firms lacked before the war.

MR. JOYNSON-HICKS, M.P.—Member of Brentford Division of Middlesex. Has been for years a strenuous critic of Governmental apathy towards the Flying Services. In 1913 and early 1914 twice convicted the War Office of lying about the number of aeroplanes available for the Royal Flying Corps. Consistently attacked Lt.-Col. Seely, when Minister for War, on aerial affairs. Supported energetically the 1915 and 1916 agitations for adequate equipment of the Flying Services, and has rendered valuable service in these matters.

PROFESSOR F. W. LANCHESTER.—Designer of the original Lanchester motor-car. Is, or at any rate was recently, connected in a technical capacity with the Daimler motor-car firm. Has contributed copiously to aeronautical journalism, and has lectured largely on the subject of the excellence of Government aeroplanes. Has addressed political voters in the Government interests against the doctrines of aeronautical reformers. Is known to have designed an aero-engine which did not function, and an aeroplane which did not fly, but is not publicly known to have designed either form of mechanism with success. Is a prominent member of the Government Advisory Committee for Aeronautics.

LIEUTENANT-COLONEL MERVYN O'GORMAN, C.B.—Formerly a consulting engineer concerned with the electrical profession and the motor-car trade. In 1909 became, during half his time per week, Superintendent of the Army Aircraft Factory at Farnborough, which later became the Royal Aircraft Factory. After the outbreak of war took up full-time employment at that establishment, and was appointed Lieut.-Col. (T.F. temp.), on the formation of a Territorial Unit R.F.C.—known as Hampshire Aircraft Parks—from among the employees of the R.A.F. After the agitations of 1916 and the investigation of the R.A.F. organisation by the "Burbidge Committee," was transferred to Adastral House as technical adviser to Lieut.-General Sir David Henderson, Director-General of Military Aeronautics.

MAJOR-GENERAL RUCK, C.B.—An able soldier and organiser. Chairman of the Aeronautical Society of Great Britain—which should be most carefully distinguished from the Aeronautical Institute, a name which is apt to be confused with it.

Under his chairmanship the Society has acquired a new lease of life, and is doing most valuable work.

MR. J. D. SIDDELEY.—Managing Director of the Siddeley-Deasy motor-car firm. Formerly of the Rover Cycle Company, and later of the Wolseley Motor Company. Has recently become concerned with the production of aero-engines.

MR. T. O. M. SOPWITH.—A pioneer of British Aviation, and in his day one of our most skilful pilots. Won the De Forest £4,000 prize in 1911 for the longest flight out of Great Britain on an all-British machine, using a Howard Wright biplane and an E.N.V. engine. Later flew in America. On his return began to build aeroplanes, and consistently beat all performances by official productions. Revolutionised ideas of design by producing the famous "tabloid" single-seater, and has since at frequent intervals produced war aeroplanes far surpassing contemporary enemy designs, only to have his own designs adopted in quantities months later, when the enemy had almost reached the same level.

Has been equally brilliant as a pilot, an originator of design, a producer in quantities, and as a business man. Possesses extraordinarily mature judgment in combination with youthfulness of idea.

MR. H. G. WELLS.—Described by the "Times" as "novelist and man of science, whose 'War of the Worlds' was almost prophetic with reference to many aerial developments of to-day." Apart from the fact that the "War of the Worlds" dealt with the visit of supposititious Martians to this world and that the title is evidently a mistake for "The War in the Air," the description seems unfitting. Unless one includes the study of the manners and customs of drapers' assistants among the sciences, one fails to see Mr. Wells' claim to be a man of science. Most of his scientific allusions seem to be based on a smattering of the kind which one might acquire from a cheap encyclopædia. The late lamented Jules Verne was far more scientific and far more prophetic, if less successful in depicting the sordidity of the lower middle classes.

Mr. Wells' chief claim to fame seems to be as a sociologist—of a somewhat entomological kind—and more recently his sociology seems to have trended towards republicanism. One fails utterly to see any reason whatever for his inclusion on this Committee.

MR. H. WHITE-SMITH.—Secretary and a Director of the British and Colonial Aeroplane Co., Ltd., the first great business to be founded exclusively for the production of aircraft. Was concerned in the foundation of this firm in conjunction with his uncle, the late Sir George White, Bart. Is Chairman of the Society of British Aircraft Constructors. A business man with an exceptionally fine training, a pioneer of aircraft construction, a man of sound judgment and of foresight, with the ability to set forth the views of aircraft constructors in a moderate manner such as cannot offend the most hardened official, his appointment is one which will be welcomed by all.

MR. W. TYSON WILSON, M.P.—Labour member for West Houghton (Lancs). Said by the "Times" to be one of the founders of the Bolton Building Trades Federation. Has recently asked in the House a few questions on aircraft of a kind which made one imagine that they were designed to help Ministers to get out statements to the advantage of the Government. Otherwise has no concern with aircraft, unless one argues that the Building Trade is as much entitled to representation as is the Motor Trade, especially in view of possible contact between commercial aeroplanes and suburban villas after the war.

SIR LAURENCE GUILLEMARD, K.C.B.—Representing the Treasury and Board of Customs. Stated by the "Times" to have been Chairman of the Board of Customs since 1908—will doubtless pay special attention to aerial smuggling.

COLONEL J. W. PRINGLE, R.E.—Representing the Board of Trade. One believes that this officer has been largely concerned with the investigation of railway

collisions. The appointment therefore seems eminently sound in view of future possibilities of aerial transport.

THE EARL OF DROGHEDA.—Representing the Foreign Office. Has long been intensely interested in aeroplanes, and has the best possible information on the latest developments constantly available to him. He possesses keen judgment, and is personally immensely popular with all who meet him either officially or unofficially, so that in our international dealings in aircraft affairs after the war, as well as in our preparations at present, he should be a most valuable member of the Committee.

MR. G. E. A. GRINDLE, C.M.G.—Representing the Colonial Office. One has to confess complete and lamentable ignorance of the qualifications of this doubtless estimable official.

MR. G. E. P. MURRAY, C.B.—Secretary of the Post Office, representing the Postmaster-General. Another excellent appointment.

THE INDIA OFFICE will be represented by Lord Montagu, who will doubtless do it justice, but one would have preferred to see Lord Montagu's imagination freed from all local ties, and to have seen some experienced Indian official appointed specially for India's benefit.

SIR THOMAS MACKENZIE, High Commissioner for New Zealand, and the **RT. HON. W. P. SCHREINER**, High Commissioner for South Africa, will represent their respective nation's interests, but one would like to see natives of those countries who have had aviation experience taken into consultation. For instance, Captain J. J. Hammond, R.F.C., could doubtless say much about the possibilities of New Zealand. Lieut. John Weston, R.N.V.R., a Burgher of the Free State, who has flown ever since 1910, who is one of the very few men who hold certificates as pilots of aeroplanes, airships, and balloons, and who has built and repaired his own aeroplanes and engines in South Africa, should be of high value to the Committee.

It is hoped that **CANADA** and **AUSTRALIA** will also nominate representatives. One hopes they will nominate some able man who knows something of practical aviation, and will not be content with purely political appointments.

CAPTAIN VYVYAN has been nominated by the Fifth Sea Lord of the Admiralty to represent the R.N.A.S., which otherwise seems poorly represented when compared with R.F.C. interests.

BRIGADIER-GENERAL BRANCKER will represent the R.F.C., an obvious and wholly praiseworthy appointment. As one who has never failed to express his faith in the future of flying, as an experienced pilot, as an able soldier, as a man of ideas, and as an administrator and organiser, General Brancker's appointment can only be productive of good results.

THE METEOROLOGICAL OFFICE has also been asked to name a representative. One hopes that his ideas on aviation will be less foggy than those of the members of that distinguished office who have hitherto delivered themselves in public on the subject.

MR. D. O. MALCOLM, whose connection with aviation is not made public, is announced as the Secretary of the Committee, whose offices will be at Winchester House, St. James's Square, S.W.

PURELY UNOFFICIAL.

It was stated officially that one or two additional names will be subsequently announced, and one hopes that these choices will be wisely made.

One notable omission so far is the name of anyone concerned with purely marine work, such as is entailed in big flying-boat problems. As the only officer in the

R.N.A.S. whom Dr. MacNamara was able to mention in the House recently as having produced a seaplane fit for service, Commander John Porte's name seems a necessary addition. Commander Porte was one of our earliest and best pilots, he has had plenty of business experience, and he has been proved to be a capable and far-sighted constructor. The pre-war Transatlantic Wanamaker-Curtiss-Porte boat has more than justified its existence, and it is the obvious machine for river transport of the future.

Commander Porte knows more about the problems of producing big flying boats than does any living man, but as he is now altogether in the Service there should be a civilian representative of the same interests, and here the choice seems to fall obviously on Mr. S. E. Saunders, of Cowes, who built the hulls for the first Sopwith "Bat-boats," which were so brilliantly successful, and has built many others since. Essentially a "marine engineer," Mr. Saunders should be a most valuable acquisition to the Committee.

Another notable omission is that of all "lighter-than-air" representatives. Personally one feels that at first many people would rather journey aurally by airship than by aeroplane, and that airship lines to Paris may for long compete with aeroplanes. The evident representative of the "lighter-than-air" branch, from a Service point of view, should be Colonel Maitland, whose quiet and convincing method of discussion, whose vast experience, and whose sound judgment should be of very great value. Also, in view of the fact that he was the only civilian airship constructor and pilot to achieve results, and as the great pioneer of British airships, Mr. E. T. Willows, should certainly be called upon for his mature knowledge.

There are other omissions, some even more surprising than some of the inclusions, and certain of these are as surprising as anything that has happened in the war. For instance, one is surprised that Mr. Butcher and Mr. Charles Bright were omitted, after the notably good work which they did on the Air Enquiry Committee as exemplified by the Committee's Report.

But probably enough has been said for the moment, till we see how the Committee shapes when it gets to work. There are sufficient able and honest men on the Committee to prevent it from ever being a real danger to the community, or even to the future of flying, and one hopes that they will so guide the whole mass that, whatever powers may ultimately be conferred upon it may be used to make up to some extent the loss of progress which has been caused by officialdom in the past.—C. G. G.

AERIAL TRANSPORT IN CENTRAL EUROPE.

The "Berliner Tageblatt" announces that at the invitation of the Austrian Aero Club a meeting was held at Vienna on May 9th to discuss "the establishment of uniformity among the Central States in aerial transport and aerial transport law. Germany was represented by Major von Tschudi and a lawyer named Tauber.

The "Tageblatt" adds:—

The discussions are directed against the efforts of particular groups of interested persons who desire to establish aerial transport routes on an international basis. This conference was summoned in order to prevent any separate undertakings which could give foreign countries an insight into German aeronautical interests.

It would be interesting to know who are the "interested persons" to whom reference is made. Is it possible that the Germans think that when the war is actually over all international air traffic will still be forbidden, and that letters or passengers travelling from England or France to Russia will have to be conveyed across Germany by German machines and pilots?

It would be as sensible to argue that no French or British motor-car may be driven across Germany by its owner, and that no German, or Austrian, or Turkish motor-car may be driven in France or England. Really, the German mind seems at times to possess all the insularity of the English mind.

THE AEROPLANE OF COMMERCE.

BY "BERKELEY."

During the past week a Government Committee has been constituted to deliberate on the questions affecting the commercial use of aircraft in the period immediately following the war. On it are brought together authorities on subjects as diverse as sensational fiction and the housing of the poor. There are some also who have knowledge of aeronautics, and the chairman himself is versed in the paths of popular thought. No terms of reference are published, and it would appear that the preliminary deliberations are to be veiled in secrecy. Neither the Central Empires nor the public prints are to be soothed by premature knowledge of possible aerial commerce of the future.

The formation of such a committee at this stage in the war has such obvious advantage that criticism of the principle involved is out of place. The composition of the committee is also little concern of the public, as any conference is in effect very like any other conference. The personal element has but little importance. Majorities possess a curious similarity in thought. There is, however, some interest in a brief consideration of some of the points affecting the future employment of aircraft in commerce.

PREHISTORIC COMMERCE.

The first clearly defined use of aircraft of both categories was as a part of the matériel of war. The first boats laboriously carved from the trunks of great trees by the knives of patient prehistoric man were in all probability not produced that one island might exchange the coconut peculiar to its soil for the edible root of another island, but that the inventors and builders might seize without wasteful payment the food and the wives of the neighbouring islanders. The expenditure of brain and time in the construction of the fleet was balanced against the proceeds of the first robbery. A little later the second island, profiting by experience, would also build a fleet possibly based on some prehistoric two-power standard. Thus a stage was reached in the world's affairs when it was cheaper to bargain than to steal, and the commercial classes began slowly to oust the thief from his previous position of eminent respectability. Without an officially ordained committee, the ships of the sea were put to commercial use.

Somewhat the same process has shaped the development of aircraft. No merchant would risk his accumulated wealth in things of air of which the efficiency had not yet been proved. The experiment lacked appeal, and confidence was held in curb until a certain degree of perfection had been attained. The Government itself

was not sure that either airships or aeroplanes were properly to be encouraged by a civilised country, and few orders were given to the new industry recently born for the sustenance of flying.

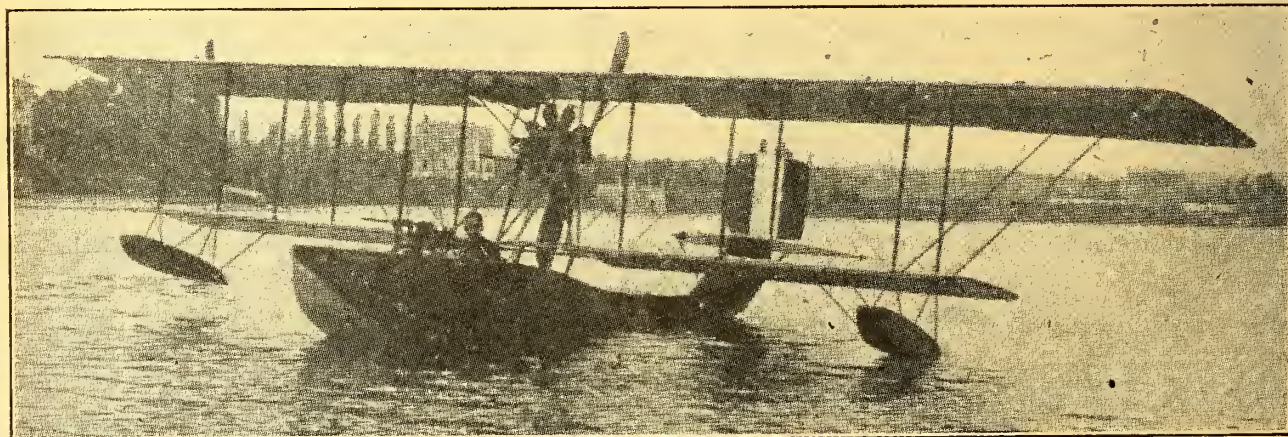
An industry cannot exist entirely on philanthropic effort. It needs financial support from actual purchasers, and it needs the spur of competition. Otherwise development is impossible. The greatest intellects in the world cannot produce work of high value unless rival effort enforces concentration. Thus in aeronautics, unless Government gave the necessary aid by the placing of large orders, progress was impossible. Commerce was waiting for successful demonstration before investing money in the new science, and a successful demonstration appeared to be impossible for lack of that same money.

Then came the war, and with it the necessity for aircraft. Progress, slow before, now became rapid, and countless firms came into existence for the design and production of aircraft. The very virtues necessary in an aeroplane designed for war purposes were those which would be of most use in peaceful employment. Before a placid German town or a "health resort" of the English coast could be bombed successfully it was necessary to increase the speed and weight-lifting capacity of the aeroplanes employed. Speed and useful load are two necessary attributes of the cargo-aeroplane of the future. And so throughout the whole series of capabilities.

THE NEED FOR DECISION.

If the matter of the commercial use of aircraft is neglected at this moment by the authorities, it is probable that the coming of peace will coincide with a great reduction of the aircraft industry, and a great loss will follow. It is necessary that at the end of the war the production of aeroplanes shall continue at the present rate at least if any impression is to be made. The only manner in which this continuance of effort can be made certain is by deciding, before the end of the war on certain definite uses of aeroplanes for immediate development and on the allocating of money for this purpose.

Any scheme for the trade use of aeroplanes will at the outset need Government support. Few business firms will care to spend money on a development which has little promise of immediate advantage, especially if they are to bear the entire cost. On the other hand, should the Government institute a series of services with a reasonable degree of reliability, there is little reason to doubt the readiness of the commercial com-



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munity to make adequate use of the available advantages and to pay such charges as are imposed. But confidence must be created before real progress comes.

The aircraft industry will not benefit from the efforts of those men of business who will make early use of an aerial service because of the obvious advertising advantages appertaining to premature foresight. The truest advance will be made, not when it is simply a gain to make use either of a dirigible balloon or an aeroplane, but when it is an essential of business to employ aircraft on certain categories of work.

The main difficulty in deciding on the commercial use of aircraft at the conclusion of the war is to decide in what manner they can be employed, so that their limited services—limited for a time at least—will be of the highest value to the country. There is no advantage in the dispatch of grain from America to England by aeroplane. Its transmission by ship would be more certain in execution, and it would not deteriorate by reason of the delay. Tea from India or from China would possess no greater inherent charm because it had crossed Asia and Europe in a cargo-aeroplane.

Urgent mails, if any mails can ever be really urgent, might be the cargo of swift aircraft travelling by allotted routes. Perishable commodities, including such articles of food for the wealthy merchant's table as are not improved by a period of decay, might all travel by the quicker passage. But in truth it must be admitted that for some time to come aerial services will confine their duties to the carrying of passengers. There is utility as well as charm in a passage by air from London to Paris or from Liverpool to New York. Time is saved, and sea-sickness, the firm adherent of the well nourished, is avoided. It is also possible that a passage by air may in a very short space of time become safer than one by sea. Improved aircraft will be less at the mercy of storms than is even the most princely liner of to-day. The somewhat careless design of Continental coasts and the provoking unevenness of the sea bottom hold no terrors for the aerial liner which flies at 5,000 feet or more. Her troubles come at the time of landing, which on painful days may be postponed a space for better weather.

One troublesome question is the type of aircraft best suited to commercial use. There will be a deadly combat between the dirigible and the aeroplane for mastery,

and for many years to come neither will win. The aeroplane will improve vastly, but so, too, will the dirigible, and none can tell with certainty what things the future may hold. The Zeppelin of to-day, circumscribed though its military uses may be, has great possibilities commercially. The three years of war have meant a decade of advance to it as well as aeroplanes.

The seaplane has peculiar attractions which will ensure its rapid improvement and employment in times of peace. By its use one great difficulty of aviation is at once eliminated, and that is the provision of landing ground. As aircraft grow larger the question of landing space will become more and more prominent. But over the sea there is little difficulty. The seaplane can be increased in size to any limit commensurate with efficiency, and there will always be room in which to alight without laying waste land possessing other and greater uses.

The main traffic by air in the immediate future will be between the continents, and the main routes will be over the oceans. Any aircraft employed on this work will require modifications permitting of a safe descent on the water in case engine power fails completely. It is therefore probable that such craft will be fitted with a boat body that an element of seaworthiness be present in case of emergency. A seaplane, designed, for instance, for cross-Atlantic work, could proceed out of an English harbour under her own power and on the surface of the water. Once in the open, she would rise to the desired height at which the allotted favouring wind was present, not alighting again on the water until the port of destination was reached. Her cumbersome plane surface might be made as adjustable as the moral codes propounded by Mr. H. G. Wells in his innumerable works of fiction. We are already a stage advanced along that particular road of development.

But surmise is useless. None can tell with any reasonable degree of certainty what the future may hold. Evolution will be gradual, but none the less it will be certain. The rapidity of development very largely depends on the commercial man himself. Unless he acquires both knowledge of and confidence in the new industry, it will lack the necessary support. Military orders alone will not give the necessary impetus. The Committee would do well to insist on the education of the people in the simplest truths of aeronautics.

THE FIRST BIG AEROPLANE RAID.

Readers of this paper at any rate cannot have been surprised by the raid on the South-east Coast on Friday last, for, though there is little enough satisfaction for the prophet who merely has to keep saying "I told you so," there is some comfort in not being agonisingly surprised at the obvious, which seems to be the state of mind of most people in these days. It is not worth while to hunt up the precise date on which this paper told its readers to expect big aeroplane raids in daylight instead of Zeppelin raids in the dark, but it is quite a long time ago. Anyhow, it is as far back as the first aeroplane raid on London.

That raid was a trial trip with a new type of German machine. The moonlight raid recently was another trial trip. This South-eastern raid was evidently a little preliminary training spin, just to get the pilots used to the real thing. Only 16 machines are known to have been employed, and three of those were lost, but one wonders whether more than those three would have been brought down if there had been 60 machines or 600 instead of 16. And if so, why should they? It is foolish to console ourselves by saying that the enemy lost 20 per cent. of his force.

Despite foolish and ill-informed criticism in the lay Press, it is known that our Home Defence aeroplanes did splendid work. But one does not imagine that night-flying anti-Zeppelin machines are precisely what are best calculated to catch Germany's high-speed bomb-droppers. It is worthy of note that the casualties to the Germans seem to have been caused by the fast fighting machines of the R.N.A.S. at Dunkirk, and so, presumably, the credit will fall to the O.C. Dover Patrol.

It will be remembered that not long ago General Brancker wisely pointed out that, though it might be impossible to prevent aeroplanes from reaching this country, it is possible to build such an air fleet that no enemy would dare to attack us

for fear of consequences. This doctrine holds good in small operations as well as large. It is obviously impossible to prevent all hostile aeroplanes from reaching this country, but it is possible to prevent them from starting.

In this specific instance, while aeroplanes suffer from present limitations it is possible to draw a map of the precise area from which such raids must start, and every possible concentration of bombing aeroplanes must take place in that area if they are to operate against England. And that area is in the radius of operations of the Officer Commanding Dover Patrol—as has been shown by sundry Admiralty announcements.

R.F.C. Home Defence Squadrons may be depended upon to do their best to repel raiders, but it is the job of Officer Commanding Dover Patrol to see that they do not start, rather than for his gallant young officers, who possess irrepressible initiative, to catch them on the way back after the damage has been done.

Of course, we shall have the usual outcry about the Hunnishness of bombing women and children, but we should clear our minds of cant in this matter. Women and children should not remain in the war zone. If the enemy is so efficient as to increase the depth of the war zone, either by long-range guns or by improved aeroplanes, and if he is allowed to operate those improved weapons, that is his good fortune and our misfortune. Our authorities are to blame for casualties, not the enemy. We must either stop the raids or evacuate the civilian population from the raidable area.

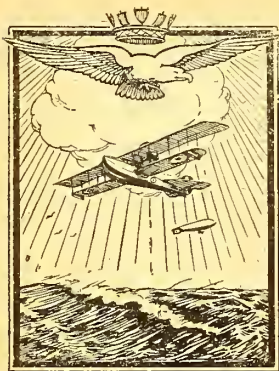
We can draw a map of England showing the area over which raiders can operate, within the known limits of their petrol supply, or we can draw a map of Flanders showing the area within which concentrations of enemy raiding machines are not to be permitted. The choice lies entirely with us, or rather with the Officer Commanding Dover Patrol, whoever he may happen to be at any given moment.—C. G. G.



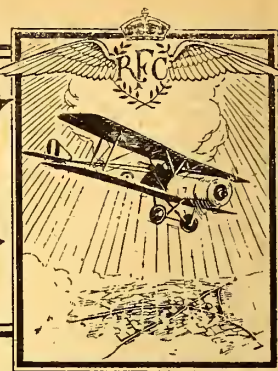
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FROM THE "LONDON GAZETTE."

ADMIRALTY, May 21st.

R.N.A.S.—Flt. Comdr. specially promoted to Sqdn. Comdr. for War Services:—R. H. Mulock, D.S.O., May 21st.

WAR OFFICE, May 22nd.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Wing Comdrs.—From Sqdn. Comdrs., and to be temp. Lt.-Cols. whilst so employed:—Capt. (temp. Maj.) L. W. B. Rees, V.C., M.C., R.A., May 1st. Capt. (temp. Maj.) R. M. Rodwell, W. York. R., May 15th.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so employed:—Temp. Sec. Lt. E. B. Mason, Gen. List, March 25th. Sec. Lt. (temp. Lt.) E. L. Benbow, M.C., R.A.; temp. Sec. Lt. H. Jackson, Gen. List; Sec. Lt. (temp. Lt.) J. Gilmour, Arg. and Sutthd. Highrs., April 1st. Capt. (temp. Maj.) D. E. Stodart, Spec. Res., reverts from Sqdn. Comdr. and relinquishes his temp. rank, April 28th, with seny. from May 6th, 1915.

MEMORANDUM.—To be temp. Maj. whilst specially employed at Army Hdqrs., India:—Qrmr. and Hon. Lt. (temp. Capt.) W. R. Bruce, R.F.C.

* * *

WAR OFFICE, May 23rd.

REGULAR FORCES.—STAFF.—TEMP. APPTS. AT THE WAR OFFICE.—Dep. Dir.—Bt. Lt.-Col. F. H. Sykes, C.M.G., Hrs., from an A.A.G., and to be temp. Brig.-Gen. whilst so empld., Feb. 8th, 1917.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—SPECIAL APPT. (graded as a Park Comdr.)—Qrmr. and Hon. Lt. (temp. Capt.) W. J. Ryan, R.F.C., an Equipment Officer, 1st Cl., and to be temp. Maj. whilst so employed, May 1st.

MEMORANDA.—Sec. Lt. (temp. Lt.) G. S. M. Taylor, R.E., T.F., to be temp. Capt. (without Army pay or allowances) whilst employed as an Inspector, Aeronautical Inspn. Dept., April 1st. Temp. Hon. Lt. P. W. Smith, Gen. List, to be temp. Hon. Capt. (without Army pay or allowances) whilst employed as an Inspector, Aeronautical Inspn. Dept., April 1st. Sec. Lt. T. H. L. Salisbury, R.F.C., T.F., to be temp. Lt. (without Army pay or allowances) whilst employed as an Asst. Inspector, Aeronautical Inspn. Dept., March 26th.

Flt. Sgt. L. A. Mudge, from R.F.C., to be temp. Sec. Lt. (on prob.), for duty with the Mil. Wing of that Corps, May 7th.

* * *

ADMIRALTY, S.W., May 23rd.

The King has been pleased to give orders for the following appointed to the Distinguished Service Order in recognition of services, under the command of Vice-Admiral Sir Reginald H. S. Bacon, during the period from July 1st to Dec. 31st, 1916:—

TO BE A COMPANION OF THE D.S.O.

Flt. Sub-Lt. John Joseph Mafone, R.N.A.S.

For successfully attacking and bringing down hostile aircraft on numerous occasions. At about 6.30 a.m. on April 23rd, 1917, while on patrol, he attacked a hostile scout and drove it down under control. He then attacked a second scout, which, after the pilot had been hit, turned over on its back and went down through the clouds. A third scout, attacked by him from a distance of about twenty yards, descended completely out of control. While engaging a fourth machine he ran out of ammunition, so returned to the advanced landing ground, replenished his supply, and at once returned and attacked another hostile formation, one of which he forced down out of control. On the afternoon of April 24th, 1917, he engaged a hostile two-seater machine and, after badly wounding the observer, forced it to land on our side of the lines.

The King has been pleased to approve of the award of the Distinguished Service Cross to the following Officers:—

Flt. Lt. Lloyd Samuel Breadner, R.N.A.S.

For conspicuous gallantry and skill in leading his patrol

against hostile formations. He has himself brought down three hostile machines and forced several others to land. On April 6th, 1917, he drove down a hostile machine which was wrecked while attempting to land in a ploughed field. On the morning of April 11th, 1917, he destroyed a hostile machine, which fell in flames, brought down another in a spinning nose-dive with one wing folded up, and forced a third to land.

Flt. Sub-Lt. Joseph Stewart Fall, R.N.A.S.

For conspicuous bravery and skill in attacking hostile aircraft. On the morning of April 11th, 1917, while escorting our bombing machines, he brought down three hostile aircraft. The first he attacked and brought down completely out of control. He was then attacked by three hostile scouts, who forced him down to within about two hundred feet of the ground. By skilful piloting he manoeuvred his machine close behind one of them, which was driven down and wrecked. Shortly afterwards this officer was again attacked by a hostile scout, which he eventually brought down a short time before recrossing the lines. He then landed at one of the aerodromes, his machine having been riddled with bullets from the hostile machines and also by rifle fire from the ground.

* * *

WAR OFFICE, May 24th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Park Comdr.—Qrmr. and Hon. Lt. (temp. Capt.) J. Starling, Gen. List, and to be temp. Maj. whilst so empld., May 1st.

Equipment Officers, 1st Cl.—Temp. Lt. L. G. Harber, Gen. List, from the 2nd Cl., and to be temp. Capt. whilst so empld., April 28th.

SPECIAL RESERVE OF OFFICERS.—SUPPLEMENTARY TO REGULAR UNITS OR CORPS.—R.F.C.—MIL. WING.—Lt. (temp. Capt.) H. B. T. Childs to be Capt., April 1st.

* * *

WAR OFFICE, May 25th.

REGULAR FORCES.—STAFF.—TEMPORARY APPOINTMENTS AT THE WAR OFFICE.—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Staff Lt.—(temp. Capt.) H. O'N. de H. Segrave, R. War. R., from a Flt. Comdr., K.F.C., and to relinquish his temp. rank, vice Maj. H. P. R. Coode, Res. of Officers, Jan. 1st, 1917.

Equipment Officers, 1st Cl.—From the 2nd Cl., and to be temp. Capts. whilst so empld.—Sec. Lt. (temp. Lt.) P. Young, Spec. Res., April 1st. Lt. L. Findlater, M.C., Manch. R., Spec. Res.; Sec. Lt. (temp. Lt.) I. N. Dracopolf, Spec. Res.; Sec. Lt. (temp. Lt.) C. G. Nevatt, Spec. Res., May 1st. Sec. Lt. (temp. Lt.) J. E. Rendle, Spec. Res., May 13th.

WAR OFFICE, May 26th.

REGULAR FORCES.—N.C.O. to be Sec. Lt. for service in the Field:—

MEMORANDUM.—FOR DUTY WITH R.F.C.—Actg. Sgt.-Maj. C. Mullen, from R.F.C., April 10th.

N.C.O., temp. Sec. Lt.:—

MEMORANDUM.—FOR DUTY WITH R.F.C.—Flt. Sgt. C. Ryder, from R.F.C., April 21st.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Sqdn. Comdrs.—From Flt. Comdrs., and to be temp. Majs. whilst so empld.:—Lt. (temp. Capt.) A. W. C. V. Parr, Rif. Brig., April 23rd. Temp. Capt. G. H. Norman, Gen. List, May 3rd.

Equipment Officers, 1st Cl.—Capt. H. Le Jeune, M.C., Spec. Res., from the 2nd Cl. From the 2nd Cl., and to be temp. Capts. whilst so empld.:—Lt. E. W. J. Payne, M.C., Spec. Res.; Sec. Lt. (temp. Lt.) O. H. Frost, Midd'x R., T.F.; temp. Lt. J. K. Mountain, Gen. List, temp. Lt. D. B. Cleghorn, Gen. List; Sec. Lt. (temp. Lt.) J. Kemper, S. Lan. R., May 1st.

MEMORANDUM.—Actg. Sgt. J. R. Bedford, from R.F.C., to be temp. Sec. Lt. for duty with Mil. Wing of that Corps, April 7th.

* * *

WAR OFFICE, May 26th.

The King has been pleased to award a Bar to the Distinguished Service Order to:—

Lt. (temp. Capt.) Allan Machin Wilkinson, D.S.O., Hamp. R. and R.F.C.

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He came down to a low altitude and destroyed a hostile scout which was attacking one of our machines, the pilot of which had been wounded, thereby saving it. In one day he shot down and destroyed six hostile machines. He has destroyed eight hostile machines during the past 10 days, and has displayed exceptional skill and gallantry in leading offensive patrols. (D.S.O. gazetted Oct. 20th, 1916.)

* * *

The King has been pleased to approve of the appointments of the following officers to be Companions of the Distinguished Service Order in recognition of their gallantry and devotion to duty in the Field:—

Temp. Sec. Lt. Clive Oliver Bertram Beale, Gen. List and R.F.C.

He made two most gallant attempts to carry out a special mission, which involved a night flight of about 50 miles, in very adverse weather. Although unsuccessful, he showed throughout the greatest courage and determination to achieve his mission.

Temp. Sec. Lt. (temp. Capt.) Augustus Wieland Bird, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty on many occasions. When on artillery patrol he succeeded in reporting 13 active batteries, observing fire on and silencing several of them. On another occasion he attacked and scattered with machine-gun fire two parties of the enemy which were seen forming up. This operation was carried out for a period of 2½ hours in very adverse weather conditions.

Capt. (temp. Maj.) Hereward De Havilland, R.F.C., Spec. Res.

He attacked and drove down a hostile machine. This is the second enemy machine he has destroyed. He has rendered invaluable service throughout the operations, and has at all times set a magnificent example.

* * *

The King has been pleased to award a Bar to the Military Cross to the undermentioned Officer:—

Capt. Robert Oxspring, M.C., York L.I., Spec. Res., and R.F.C.

For conspicuous gallantry and devotion to duty on several occasions. He has brought down three hostile machines, and, in addition, has forced several others to land. He has at all times set a splendid example of courage and initiative. (M.C. gazetted Jan. 14th, 1916.)

* * *

The King has been pleased to confer the Military Cross on the following Officers in recognition of their gallantry and devotion to duty in the Field:—

Sec. Lt. (temp. Lt.) Laurence Wilfred Allen, R. War. R., attd. R.F.C.

When acting as an observer, on many occasions he has helped to shoot down and destroy hostile machines. He has shown the greatest coolness and skill on all occasions, frequently clearing difficult jams in the middle of a fight.

Lt. (temp. Capt.) Harold Harington Balfour, K.R.R.C. Spec. Res. and R.F.C.

On many occasions he has carried out many valuable reconnaissances under very adverse conditions. He has shot down two hostile machines.

Temp. Lt. (temp. Capt.) Alan Einnie, Gen. List and R.F.C.

He came down to 50 ft. and attacked a hostile kite-balloon on the ground. He has on previous occasions shot down and destroyed three hostile machines.

Sec. Lt. William Buckingham, R.F.C., Spec. Res.

He displayed great courage and initiative in carrying out a patrol in heavy rain, with clouds at 500 ft., during an enemy attack. He obtained valuable information, and undoubtedly contributed largely to the successful repulse of the enemy.

Sec. Lt. Walter William Glenn, R.F.A. and R.F.C.

He saved one of our machines from being destroyed, and drove down a hostile machine out of control. Later, although severely wounded, he succeeded in bringing down a second hostile machine.

Temp. Lt. Ernest George Green, R.E. and R.F.C.

As an observer, he has on several occasions brought down hostile machines, and has carried out many successful photographic reconnaissances. He has at all times set a fine example of courage and initiative.

Sec. Lt. Lionel Baker Jones, Welsh R. and R.F.C.

When acting as an observer, he has on many occasions assisted in beating off hostile machines. He has done exceptionally fine work in artillery observation.

Temp. Lt. Philip James Vaughan Lavarack, Gen. List and R.F.C.

While on a photographic patrol he shot down and destroyed a hostile machine. He has done consistently good work in artillery observation and photography throughout the operations.

Lt. (temp. Capt.) John Hamilton Norton, Gen. List and R.F.C.

He reconnoitred the enemy's wire at the height of 300 ft., and brought back most valuable information. He has at all times displayed great courage and skill.

Sec. Lt. (temp. Capt.) Frank Lawrence James Shirley, York R. and R.F.C.

He displayed great courage and skill on many occasions in photographing the enemy's position. On one occasion, although severely wounded, he completed his work, and succeeded in landing his machine safely.

Sec. Lt. George Ronald Yorston Stout, A. and S. Highrs., attd. R.F.C.

When on infantry contract patrol he flew twice for periods of two hours at a very low altitude, and, on each occasion, brought in a very complete and detailed report of the situation of the attack. He has at all times displayed great courage and skill.

Capt. John Thomas Waller, Leic. R. and R.F.C.

He has consistently carried out with unflinching success long reconnaissances and daring bombing raids.

CANADIAN FORCE.—Lt. William Avery Bishop, Can. Cav. and R.F.C.

He attacked a hostile balloon on the ground, dispersed the crew, and destroyed the balloon, and also drove down a hostile machine which attacked him. He has on several other occasions brought down hostile machines.

* * *

The King has been pleased to approve of the award of the Distinguished Conduct Medal to the following Warrant Officer and Non-Commissioned Officer for acts of gallantry and devotion to duty in the Field:—

Z185 Flt. Sgt. D. Grant, R.F.C.

Z181 Sgt.-Maj. J. E. Pearson, R.F.C.

* * *

The King has been pleased to award the Military Medal for bravery in the Field to the undermentioned Men:—

10708 Pte. T. E. Allum, E. Surr. R., attd. R.F.C.

* * *

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign. The King has given unrestricted permission in all cases to wear the Decorations and Medals in question:—

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CAVALIER.

Lt. (temp. Maj.) S. A. Currin, R.F.C., S.R.

Maj. (temp. Lt.-Col.) N. A. Orr-Ewing, D.S.O., Scots Gds.

Capt. (temp. Maj.) T. V. Smith, M.C., R.F.C., S.R.

THE SILVER MEDAL FOR MILITARY VALOUR.

Temp. Sec. Lt. (temp. Capt.) A. W. Bird, Gen. List and R.F.C.

Sec. Lt. G. G. Callender, R.F.C., S.R.

Lt. (temp. Capt.) H. E. Hartney, Special List and R.F.C.

Lt. (temp. Capt.) H. W. G. Jones, Welsh R. and R.F.C.

Temp. Lt. (temp. Capt.) J. M. McAleery, Gen. List and R.F.C.

Sec. Lt. F. H. B. Selous, R. West Surrey R. and R.F.C.

Capt. A. W. Tedder, Dorset R. and R.F.C.

THE BRONZE MEDAL FOR MILITARY VALOUR.

12188 1st Cl. Air Mech. G. W. Allen, R.F.C.

4790 Sgt. J. H. Booth, R.F.C.

40286 2nd Cl. Air Mech. R. H. Calcutt, R.F.C.

11820 Sgt. J. A. Cunliffe, R.F.C.

2679 Sgt. G. H. Currall, R.F.C.

5025 Sgt. J. H. R. Green, R.F.C.

2124 Cpl. C. S. Hosegood, R.F.C.

3403 Sgt. W. Joiner, R.F.C.

3053 Cpl. H. G. W. Lock, R.F.C.

9606 Cpl. S. W. Machin, R.F.C.

3685 Flt. Sgt. G. Marriner, R.F.C.

1933 Flt. Sgt. P. Warner, R.F.C.

* * *

FROM THE COURT CIRCULAR.

BUCKINGHAM PALACE, May 23rd.

The following Officers had the honour of being received by His Majesty, when the King invested them with the Insignia of Companions of the Order into which they have been admitted:—

THE DISTINGUISHED SERVICE ORDER.

Lt.-Col. Ralph Donaldson-Hudson, R.F.C.

Lt.-Col. Alfred Huggins, R.F.C.

Capt. Charles Portal, Royal Engineers and R.F.C.

His Majesty then conferred decorations as follows:—

THE MILITARY CROSS.

Lt.-Col. Thomas Daniell, General List and R.F.C.

Lt.-Col. Albert Fletcher, R.F.C.

Capt. Cecil Gordon-Davis, North Staff. Regt. and R.F.C.

Capt. Robert Knowles, Norfolk Regt. and R.F.C.

Capt. Charles Portal, Royal Engineers and R.F.C.

Lt. Arnold Harrow-Bunn, R.F.C.

Lt. John Jaques, General List, attd. R.F.C.

Lt. Loudoun Maclean, R.E. and R.F.C.

Sec. Lt. Robert Walker, General List and R.F.C.

NAVAL.

The following appointments have been made in the Royal Naval Air Service:—

May 22nd.—Chapn. the Rev. C. J. E. Peshall, B.A., to the

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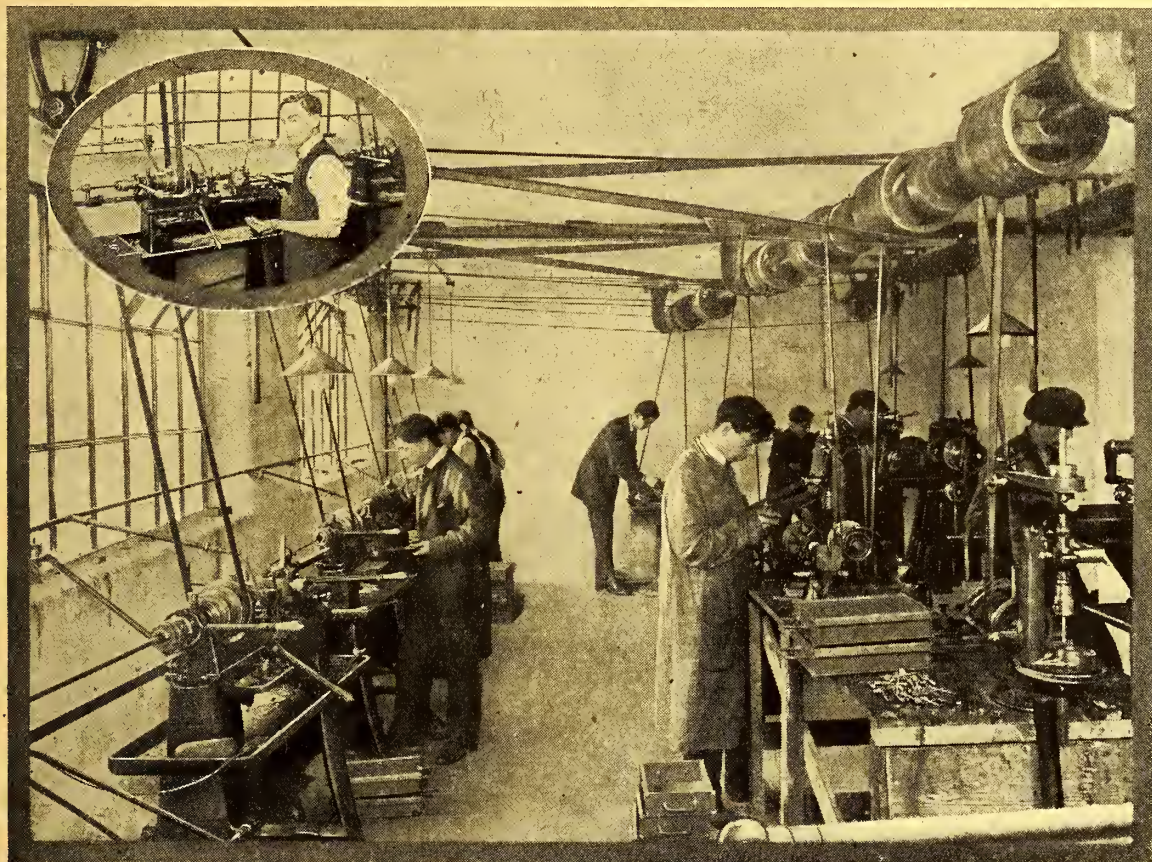
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KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS

"President," for Royal Naval Air Station, Kingsnorth, to date May 25th.

MAY 22nd.—Temp. commissions as Lt. (R.N.V.R.) have been granted to the following, seny. May 22nd:—C. E. Link, L. A. Kennedy, and Sir James K. D. Mackenzie, Bt.

The following temp. entry (R.N.V.R.) has been made, seny. May 23rd:—Lt.—A. H. Stuart.

MAY 26th.—Temp. Commissions (R.N.V.R.) have been granted to the following, seny. May 25th:—Lts.—J. B. Butler and W. B. Walton.

ADMIRALTY COMMUNIQUÉ.

MAY 26th, 1.10 p.m.—Naval aeroplanes carried out an attack on the aerodrome at St. Denis Westram, near Bruges, yesterday morning. Many bombs were dropped.

In the evening several enemy aircraft, returning from a raid on England, were engaged oversea by R.N.A.S. machines. An encounter took place between one British and three hostile aeroplanes in mid-channel and one of the latter was destroyed.

Several encounters also took place off the Belgian coast, in which two large twin-engined hostile machines were shot down. All our machines returned safely.

[See Home Command and German Communiqués of same date.—Ed.]

THE CASUALTY LIST.

Reported May 23rd.

KILLED.—Haig, Flt. Sub-Lt. J. D., R.N.

Keightley, Sub-Lt. G., R.N.V.R.

WOUNDED.—Burnside, Lt. G. E. M., R.M.

Pattison, Flt. Sub-Lt. C. E., R.N.

MISSING.—Bowman, Flt. Sub-Lt. G. G., R.N.

Ellis, Flt. Sub-Lt. O. B., R.N.

INJURED.—Hardman, Flt. Lt. E. P., R.N.

Fox, Sub-Lt. C. S., R.N.V.R.

Reported May 24th.

CORRECTION.—PREVIOUSLY REPORTED PRISONER, NOW REPORTED

KILLED.—Portsmouth, R. S., Air Mech., 2nd Gde., F.7815.

Reported May 28th.

MISSING (BELIEVED KILLED).—Smith, Flt. Sub-Lt. H. D., R.N.

MISSING.—Pailthorpe, Flt. Lt. H. A., R.N.

Morris, Flt. Sub-Lt. H. M., R.N.

Smith, Flt. Sub-Lt. H. L., R.N.

WOUNDED.—de Roeper, Flt. Lt. B. P. H., R.N.

Hall, Flt. Sub-Lt. F. V., R.N.

ACCIDENTALLY INJURED.—Drummond, Flt. Sub-Lt. C. B. de T.,

Cotterell, Flt. Sub-Lt. G. C. B., R.N.

Pepper, Prob. Flt. Officer H. T., R.N.

R.N.

Reported May 29th.

ACCIDENTALLY KILLED.—Armstrong, Lt. P. T., R.N.V.R.

Sims, Flt. Sub-Lt. J. T., R.N.

MISSING.—Laurence, Flt. L. C., R.N.

Bennett, Sub-Lt. L. J., R.N.V.R.

ACCIDENTALLY INJURED.—Yates, Proby. Flt. Officer H. W., R.N.

Nunn, Flt. Sub-Lt. C. S., R.N.

PERSONAL NOTICE.

BIRTH.

McMINNIES.—On Whit Sunday, at "Homeside," Eastbourne, the wife of Flt. Comdr. McMinnies, R.N.—a daughter.

MILITARY.

G.H.Q. COMMUNIQUÉS.

MAY 22nd, 8.25 p.m.—One German aeroplane was brought down yesterday in air fighting, and one other hostile machine was driven down out of control. One of our aeroplanes is missing.

MAY 23rd, 8.30 p.m.—Owing to unfavourable weather conditions there was less activity in the air yesterday, and little fighting. One German aeroplane was driven down out of control.

MAY 24th, 8.2 p.m.—Activity in the air increased yesterday, and a number of fights took place.

Five German machines were brought down by our aeroplanes, and six other hostile machines were driven down out of control.

Three of our aeroplanes are missing.

MAY 25th, 8.27 p.m.—There was great activity in the air yesterday. Seven German aeroplanes were brought down in air fighting, and five other hostile machines were driven down out of control.

Six of our machines are missing.

MAY 26th, 9.13 p.m.—Many air reconnaissances and bombing raids were carried out by us yesterday.

In air fighting five German aeroplanes were brought down and five others were driven down out of control.

Five of our aeroplanes are missing.

MAY 27th, 8.40 p.m.—Three German aeroplanes were brought down in air fighting yesterday and eight other hostile machines were driven down out of control.

Four of our aeroplanes are missing.

MAY 28th, 8.48 p.m.—Reconnaissances and bombing raids were continued actively yesterday by our aeroplanes.

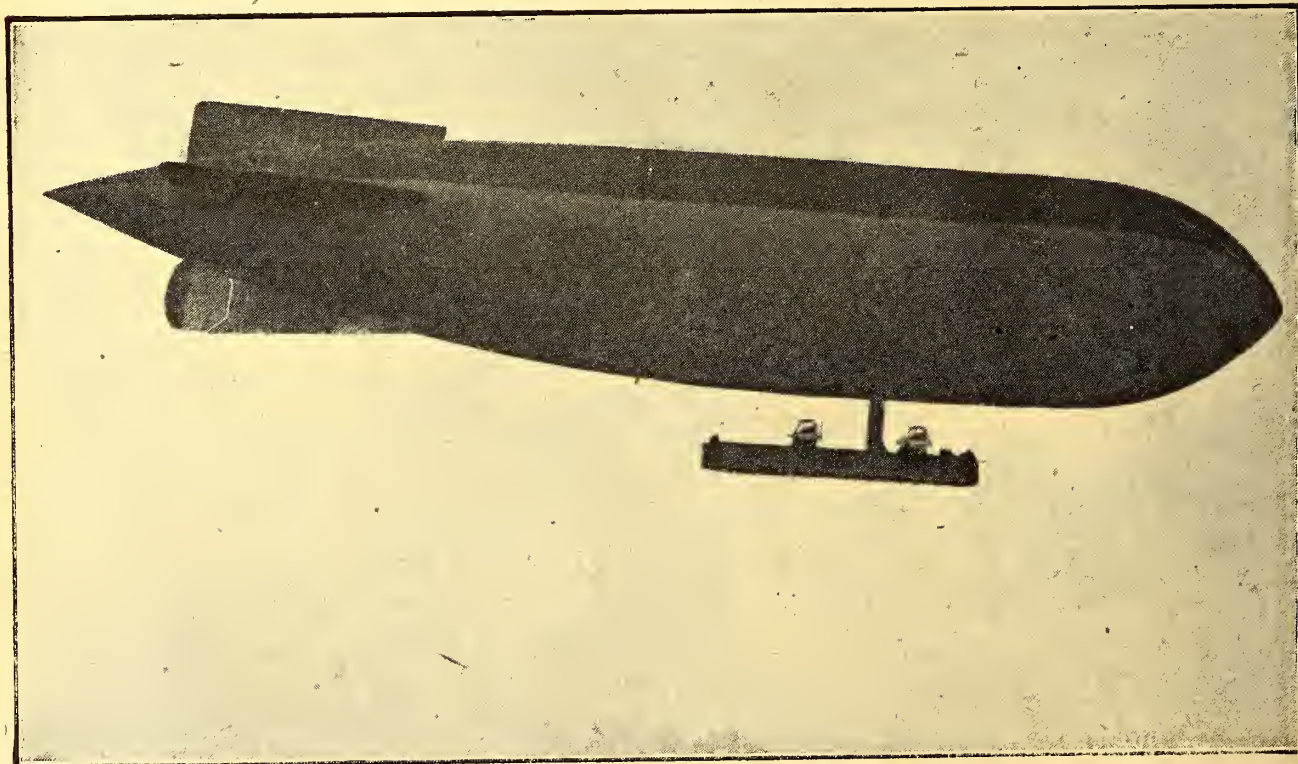
A large number of fights took place, in the course of which 12 German machines were destroyed and 10 others were driven down out of control. One other hostile machine was shot down by our anti-aircraft guns.

Three of our aeroplanes are missing.

HOME COMMAND COMMUNIQUÉS

MAY 24th, 11.45 a.m.—Four or five hostile airships approached the coast of East Anglia shortly before midnight last night. The weather was overcast, and a thick bank of raincloud made observation difficult.

Four airships appear to have penetrated inland into the



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Eastern Counties. They followed erratic courses and dropped a number of bombs in country districts, apparently being unable to locate their positions.

The raiders were pursued by our aeroplanes, but the thick clouds enabled them to make good their escape.

One man was killed in a Norfolk village. The material damage is believed to be negligible.

MAY 26th, 1.10 p.m.—A large squadron of enemy aircraft, about 16 in number, attacked the South-East of England between 5.15 and 6.30 p.m. last night.

Bombs were dropped at a number of places, but nearly all the damage occurred in one town, where some of the bombs fell into the streets, causing considerable casualties among the civil population.

Some shops and houses were also seriously damaged.

The total casualties reported by the police from all districts are:—

Killed, 76; injured, 174.

Of the killed, 27 were women and 23 children, while 43 women and 19 children were injured.

Aeroplanes of the Royal Flying Corps went up in pursuit and the raiding aircraft were engaged by fighting squadrons of the R.N.A.S. from Dunkirk on their return journey.

The Admiralty report that three of the enemy aeroplanes were shot down by the latter.

[See Admiralty and German Communiqués of same date.—Ed.]

THE CASUALTY LIST.

Reported May 23rd.

WOUNDED.—Heseltine, Sec. Lt. G. C., R.F.C.

MISSING.—Robertson, Lt. J. R., Yeo. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Adams, Lt. A. T., Wilts. R., attd. R.F.C.

Strange, Sec. Lt. L. A. T., Bufts and R.F.C.

Townsend, Lt. E. J. D., R.F.A., attd. R.F.C.

CANADIAN CONTINGENT.—MISSING.—Raymond, Lt. A. B., A.S.C., attd. R.F.C.

Reported May 24th.

KILLED.—Holm, Sec. Lt. F. D., R.E. and R.F.C.

Leighton, Maj. J. B. T., M.C., S. Gds., attd. R.F.C.

McCormick, Lt. E. J., R. Innis. Fus., attd. R.F.C.

Stewart, Sec. Lt. V. F., Durh. L.I., attd. R.F.C.

Troup, Sec. Lt. J. G., Cameronians, attd. R.F.C.

ACCIDENTALLY KILLED.—Dennett, Sec. Lt. S. H., Shropshire L.I., attd. R.F.C.

DIED.—Drey, Lt. A., M.C., Army Service Corps, attd. R.F.C.

WOUNDED.—Ingram, Sec. Lt. H. W., R.F.C.

Wheatley, Sec. Lt. E. E. S., R.G.A., attd. R.F.C.

MISSING.—Curphey, Capt. W. G. S., M.C., R.F.C.

Miller, Sec. Lt. G. B., High. L.I., attd. R.F.C.

Sutherland, Sec. Lt. A. M., North'd. Fus., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS OF WAR IN GERMAN HANDS.—Handley, Sec. Lt. F. A. W., R.E., attd. R.F.C.

Percival, Sec. Lt. E., Norf. R., attd. R.F.C.

KILLED.—R.F.C.—Oliver, 16782 2nd Cl. Air Mech. K. (Golder's Green, N.W.).

Reported May 25th.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Allport, Sec. Lt. M., R.F.C.

Clayton, Sec. Lt. G., W. Yorks. R., attd. R.F.C.

Gale, Sec. Lt. J. H., R.F.C.

Samuels, Sec. Lt. G. B., Durh. L.I., attd. R.F.C.

WOUNDED.—Senior, Capt. N., D. of Well. R., and R.F.C.

AUSTRALIAN FORCE.—WOUNDED.—Tunbridge, Sec. Lt. J. V., F.C.

Reported May 26th.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Elgey, Sec. Lt. E., R.F.A. and R.F.C.

PREVIOUSLY REPORTED PRISONERS, NOW REPORTED WOUNDED AND PRISONERS IN GERMAN HANDS.—Bennett, Sec. Lt. C. D., R.F.C.

Bird, Lt. C. B., M.C., R.F.A., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Dougall, Sec. Lt. C. R., A. and S. High. and R.F.C.

Knight, Sec. Lt. N. L., R.F.C.

Pepper, Sec. Lt. A. C., R.F.C.

Robinson, Capt. W. L., V.C., Worc. R., attd. R.F.C.

Thornton, Sec. Lt. C. P., L'pool R., attd. R.F.C.

Van Baerle, Sec. Lt. P. E. H., W. Yorks. R., and R.F.C.

Warburton, Sec. Lt. E. D., R.F.C.

Reported May 28th.

KILLED.—Howard, Sec. Lt. E. S., R.E., attd. R.F.C.

Mills, Maj. G. D., Sher. For., attd. R.F.C.

Strachan, Sec. Lt. B., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—

Kitchin, Sec. Lt. F. L., Glouc. R., attd. R.F.C.

Knight, Lt. O. R., R. W. Surr. R. and R.F.C.

WOUNDED.—Brettell, Sec. Lt. W. P. MacD., R.F.C.

De Conway, Sec. Lt. J., Yeo. and R.F.C.

Duncan, Lt. H. J., M.C., R.F.C.

Hall, Sec. Lt. R. L., R.F.C.

Hatcher, Sec. Lt. W. O., Cameronians, attd. R.F.C.

Stutchfield, Sec. Lt. M. E., R.F.A., attd. R.F.C.

Wallace, Sec. Lt. W., R.F.C.

MISSING.—Cole, Sec. M. G., R.F.C.

Holmes, Sec. Lt. J. D. V., R.F.C.

Lines, Sec. Lt. T. H., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND

PRISONER IN GERMAN HANDS.—Matthews, Sec. Lt. F., R.F.C.

KILLED.—R.F.C.—Aspinall, 43682 2nd Cl. Air Mech. T. (Heywood).

CANADIAN CONTINGENT.—KILLED.—MacKay, Lt. A. G., Quebec Regt., attd. R.F.C.

MISSING.—Drummond, Lt. L., Engineers, attd. R.F.C.

Reported May 29th.

KILLED.—Goodban, Sec. Lt. M. S., E. Surr. R., attd. R.F.C.

Hall, Capt. W. T., R.F.C.

Ward, Sec. Lt. P. H. B., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—

Bowyer-Bower, Capt. E. W., E. Surr. R., attd. R.F.C.

Sequin, Sec. Lt. V. H., R.F.C.

DIED OF WOUNDS.—Mills, Maj. G. D., Sher. For. and R.F.C.

Neville, Sec. Lt. H. G., R.F.C.

Reeve, Sec. Lt. C. F., R.F.C.

Ryan, Lt. J. H., R.F.C.

Senior, Lt. J., R.F.C.

MISSING.—Grandin, Sec. Lt. R. J., A. S.C., attd. R.F.C.

KILLED.—R.F.C.—Burtenshaw, 239 Sgt. W. J. (Thornton Heath).

PERSONAL NOTICES.

DEATHS.

ANNESLEY and BEUMONT.—A Norfolk coroner held an inquest relative to the death of Capt. James Ferguson St. John Annesley, R.A.M.C., and Sec. Lt. Charles Leslie Beumont, R.F.C., who were killed whilst flying in an aeroplane on May 19th. Evidence was given that Capt. Annesley was a medical officer, 52 years of age, and formerly practised in Ireland. Mr. Beumont was 18 years of age, and joined the Flying Corps direct from school. He was a qualified pilot, and used to flying the type of machine in which he was killed. Mr. Beumont took the machine up with Dr. Annesley as passenger.

An air mechanic gave evidence that he saw the machine pass over a road at a height of about 400 ft. The machine later did a right bank, which developed into a spinning nose-dive. Witness went to the wreckage, and found the doctor thrown clear, but the pilot was pinned underneath the machine.

Capt. P. W. Elliott said the doctor told him it was very difficult for him to judge the effect of flying on nerves until one had had personal experience. He asked if there would be any objection to going up as passenger, and witness said there would be none as he would be doing it in his official capacity.

Major Orton said he thought the machine stalled, which developed into a spiral nose-dive through losing flying speed.

A verdict of accidental death was returned.

Captain James Ferguson St. John Annesley, R.A.M.C., whose death is announced above was the son of the late Canon Annesley, Rector of Drumkeeran, co. Fermanagh. He got his commission on Jan. 17th, 1916, and was promoted captain a year later. After many months' service at sea he was appointed a month ago medical officer to an aerodrome. He married in 1898 Geraldine Clara, third daughter of the late Rev. J. A. Carr, LL.D., Canon of Christ Church Cathedral, Dublin, and leaves a widow and four children.

BRODIE.—Lt. Charles Gordon Brodie, London Regt., attd. R.F.C., who was killed while flying abroad on May 23rd, was the elder son of the late Charles T. Brodie and of Mrs. Brodie, of 108, Fordwych Road, W. Hampstead. He was aged 20.

CARTER.—Sec. Lt. Wilfred Arthur Douglas Carter, the Dorsets, attached R.F.C., who was killed while flying as a passenger on May 23rd, was the eldest son of Henry Wilfred Carter, of Norwood, and Carey Street, Lincoln's Inn. He was 20 years old.

DAVIDSON.—Capt. Donald Alastair Leslie Davidson, M.C., R.F.C. (reported killed in action on April 30th), was the elder son of the late Colonel Leslie Davidson, C.B., R.A., who died on active service in France in 1915, and of Lady Theodora Davidson, sister of the present Earl of Albemarle. Capt. Davidson was born in 1891 and was educated at Wellington College, and was Page of Honour to King Edward VII., 1902 to 1907. He joined the Royal Flying Corps as a flying officer in May, 1915, on his recovery from a long illness. He went on service in Oct. 1915, first to Egypt and then to Mesopotamia. There he was badly wounded in a fight, while dropping food over the beleaguered town of Kut.

He was awarded the Military Cross for "conspicuous determination and gallantry" on that occasion, and was invalided home on account of the severity of his several wounds. He returned

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to active service in France in the spring of this year, and was reported "missing" on April 30th, and is now notified killed while fighting, single-handed, a two-seater Hun machine. Thus ends a short but well-filled life. The King and Queen have expressed their "sympathy and sorrow for the dear boy who had already rendered such gallant service," and Queen Alexandra for "her dear Page of Honour."

DAY.—John Charles Day, Sec. Lt. Royal Sussex Regt., attd. R.F.C., who was killed in action on May 6th, was the eldest son of the late E. F. Day and of Mrs. Day, of Inglesbatch, Grahamsdown, and grandson of the late Sir John Day.

GUNNERY.—Sec. Lieut. Cedric L. Gunnery, R.F.C., who was killed in action on May 22nd, was the elder and most beloved son of L. H. and Lily A. Gunnery, of Glengarry, Thames Ditton. He had his commission in August, 1916, and was gazetted flying officer in January of this year.

HALL.—William Teasdale Hall, R.F.C., who was killed in action on May 19th, was the only son of Mr. and Mrs. F. Asa Hall, Toronto, aged 24 years.

HEMPHILL.—Sec. Lieut. Richard Patrick Hemphill, Leinster Regt. and R.F.C., was killed by the fall of his machine on March 24th. He had been on foreign service since May, 1915, having previously been a medical student of Trinity College, Dublin, and an active member of the Students' Volunteer Missionary Union. He was one of the three soldier sons of the Rev. Dr. Hemphill, of Hamilton, Ailesbury Road, Dublin. A brother officer writes:—"For nearly a year he was under me during 1915, when I was adjutant, and, for a short time, his company commander, and I can honestly say I never knew a more conscientious, capable, or plucky soldier. He was loved by his men, and had he been spared I feel sure he would have made a great name for himself if opportunity occurred. I think he was one of the nicest boys I ever met, and one I shall never forget."

JENKINS.—Capt. Christopher H. Jenkins, Royal Sussex Regt., attached R.F.C., who died of wounds on May 22nd, was the youngest son of the late Dr. Jenkins and of Mrs. Jenkins, 35, The Avenue, West Ealing, aged 19 years.

JOHNSON.—A verdict of "Accidental death" was returned at an inquest at Westminster on May 28th on the body of Stanley Morrell Johnson, aged 18, second lieutenant, R.F.C., whose parents live at Bridlington, Yorkshire.

It was said that he was an experienced and capable aviator, and had flown a distance of 30 miles to Dover on April 16th. While preparing for the return flight, and while his machine was travelling along the ground, a sudden gust of wind turned it over. The aeroplane caught fire, and before Mr. Johnson could be released he was badly burned. He died in Queen Alexandra's Hospital, London, last Friday. Just before his death he said that the accident was due to a gust of wind.

LINDLEY.—Sec. Lt. E. W. Lindley, Manchester Regt., attd. R.F.C. (reported missing on Feb. 16th, now reported died in German Field Hospital in France), was the younger son of Mr. and Mrs. E. T. Lindley, of Vambury, Norbury. He was 20 years of age, and had his commission in the Manchester Regt. in July, 1915, being gazetted flying officer in Jan., 1917.

McMURTRY.—Major Eric Ogilvie McMurtry, Canadian Infantry, who was killed while on patrol work for the R.F.C., on April 28th, was the youngest son of Mr. and Mrs. S. A. McMurtry, of Montreal. He was born in Canada in 1894, and graduated from the Royal Military College, Kingston, in June, 1914. At the outbreak of war he took a commission in the Canadian Infantry, and in 1915 he came overseas with a battalion and served with them at the front with the rank of Major. Early in January, 1917, he was transferred to the R.F.C., and went to the front again on April 18th, but ten days later his machine was brought down. His C.O. writes of him:—"Although he had been with us such a short while he had already proved his value, and I was hoping great things of him. His ability and personality at once endeared him to us all, and gave him a very high place among us."

MILLS.—Capt. Gerald Desmond Mills, Sherwood Foresters, Major and Squadron Commander, R.F.C. (killed on May 19th at the front as the result of an aeroplane accident), was 26 years of age, the youngest son of Canon Mills, Bennington Rectory, Stevenage. He had his commission in the Sherwood Foresters in Oct., 1910, and entered the Royal Flying Corps in Oct., 1914. In March of last year he was gazetted Squadron Commander, and in the following July he was appointed Officer Commanding the Testing Squadron. He was a brilliant pilot and an able officer, who was admired by his juniors for his skill and respected for his ability. In him the R.F.C. has lost an officer who was obviously marked for further distinction.

SCHOLFIELD.—Sec. Lieut. Scholfield, R.F.C., was killed at Hungerford on May 26th. An Army biplane was seen flying at a great height, and sounds made by the engine seemed to indicate that something was wrong. The machine was seen to pitch and turn over, and, descending nose foremost, it landed in the garden of the mayor of the town. Mr. Scholfield was killed instantly.

TAILFORD.—Capt. John W. Tailford, Border Regt. and R.F.C., was killed while flying on May 21st. He was the only son of Mrs. Tailford, of 35, York Place, Baker Street, N.W.,

and was a civil engineer. On the outbreak of war he received a commission in the Border Regt. He had been mentioned in dispatches for conspicuous bravery in the field and had been awarded the Military Cross. Subsequently he joined the Royal Flying Corps. He was aged 24 and leaves a widow and one boy.

TOMLINSON.—Capt. Hugh Tomlinson, M.C., R.F.C., previously reported missing on April 2nd, is now reported to have died in German field hospital (Orgnies, in France) from wounds received in action on that date. He was the youngest son of the late G. W. Tomlinson, F.S.A., Woodfield, Huddersfield, and Mrs. Tomlinson, 65, Iverna Court.

VINCE and CRAPP.—Sec. Lt. William John Douglas Vince, R.F.C., and Sec. Lt. C. F. Crapp, R.F.C., were killed in an air collision at Hove on May 23rd.

The two officers were flying in biplanes, forming part of a squadron proceeding in a westerly direction, shortly before 6 o'clock at a good height, when their machines came into collision. One of the aeroplanes apparently buckled up and immediately fell to the ground in Marine Park, Aldrington. The other aeroplane continued its flight for a few seconds, and then an explosion occurred and the machine nose-dived towards the beach at Hove.

The engine of the machine which fell at Aldrington was embedded in the ground. Both aeroplanes were completely wrecked, and the pilots were dead when extricated. A crowd of several thousands quickly assembled near the place where the machines fell.

A verdict of "Accidental death" was returned on May 24th at Hove at the inquest. The leader of the flight of four said they were flying in diamond formation at a height of 4,500 ft. He gave the order for the formation to break up, and in carrying this out Crapp came into collision with Vince. Neither could see the other owing to the sun. Asked if there was not some unnecessary danger in manœuvring over a town like that the officer replied, "No, not really. This was a most unlucky accident."

WARD.—News has been received that Sec. Lt. Percy Ward, R.F.C., has been killed in action. The son of Mr. Harry Ward, of Waltham, the young officer joined the Army early in the war as a private. Recently he received his commission. He had been at the front six weeks.

MARRIAGE.

PRESTON—HAYNE.—On May 22nd, quietly, at Rolleston Parish Church, Wilts, Capt. I. P. Harvey Preston, R.F.C., second son of the late Mr. J. Harvey Preston and Mrs. Preston, of 14, Eliot Vale, Blackheath, S.E., was married to Gladys Irene, only daughter of Mr. W. Hayne, J.P., and Mrs. Hayne, of Frietuna, Frinton-on-Sea, Essex, by Capt. Aitken, C.F.

BIRTHS.

HOSKEN.—On May 22nd, at Windmill Cottage, Winchelsea, to Gabrielle, wife of Sec. Lt. S. T. Hosken, R.F.C., a son.

ROBERTSON.—On May 21st, at Dunster Lodge, Isleworth, the wife of Capt. Norman Robertson, R.F.C., of a son.

The Officers and N.C.O.'s of the R.F.C. held their sports on May 28th at Ascot.

Air Mechanic Neal won the high jump at 5 ft. 2½ in. and the long jump at 17 ft. 6½ in. Air Mechanic Tier won both the Windsor to Ascot six miles race, for Capt. H. R. Vagg's cup, and the 2½ miles race (once round the racecourse) for the cups presented by Lord Churchill and Lieutenant-Colonel Gordon Carter. The Officers' 100 yards race resulted as follows:—Second Lieutenant Lewis, 1; Second Lieutenant McKie, 2; Second Lieutenant Pape, 3. Time, 13 sec.

FRANCE.

OFFICIAL COMMUNIQUÉS.

MAY 22nd.—During the day of the 21st our pilots brought down two German captive balloons, which fell in flames.

MAY 23rd.—It is confirmed that two further German machines were brought down by our pilots, one on May 13th and the other on the 18th.

MAY 24th.—During the night of May 23rd our bombarding aeroplanes dropped 2,200 kilogrammes (over two tons) of bombs on the railway stations in the region of Rethell, where fires broke out.

MAY 24th.—ARMY OF THE ORIENT.—British aircraft bombarded an enemy convoy in the Rupel Pass (Struma Front).

MAY 26th.—During the 23rd, 24th, and 25th our pilots brought down in aerial combats 10 enemy aeroplanes. Seventeen other machines were obliged to land in a damaged condition behind their own lines.

During numerous bombardments carried out by our air squadrons in the same period the railway stations of Mars la Tour (about 14 miles west-south-west of Metz), Chambley (south of Mars la Tour), Conflans (about 15 miles west of Metz), Vouziers (about 30 miles north-west of Verdun), and Anizy (south-west of Laon), and the bivouacs in the region of Laon received

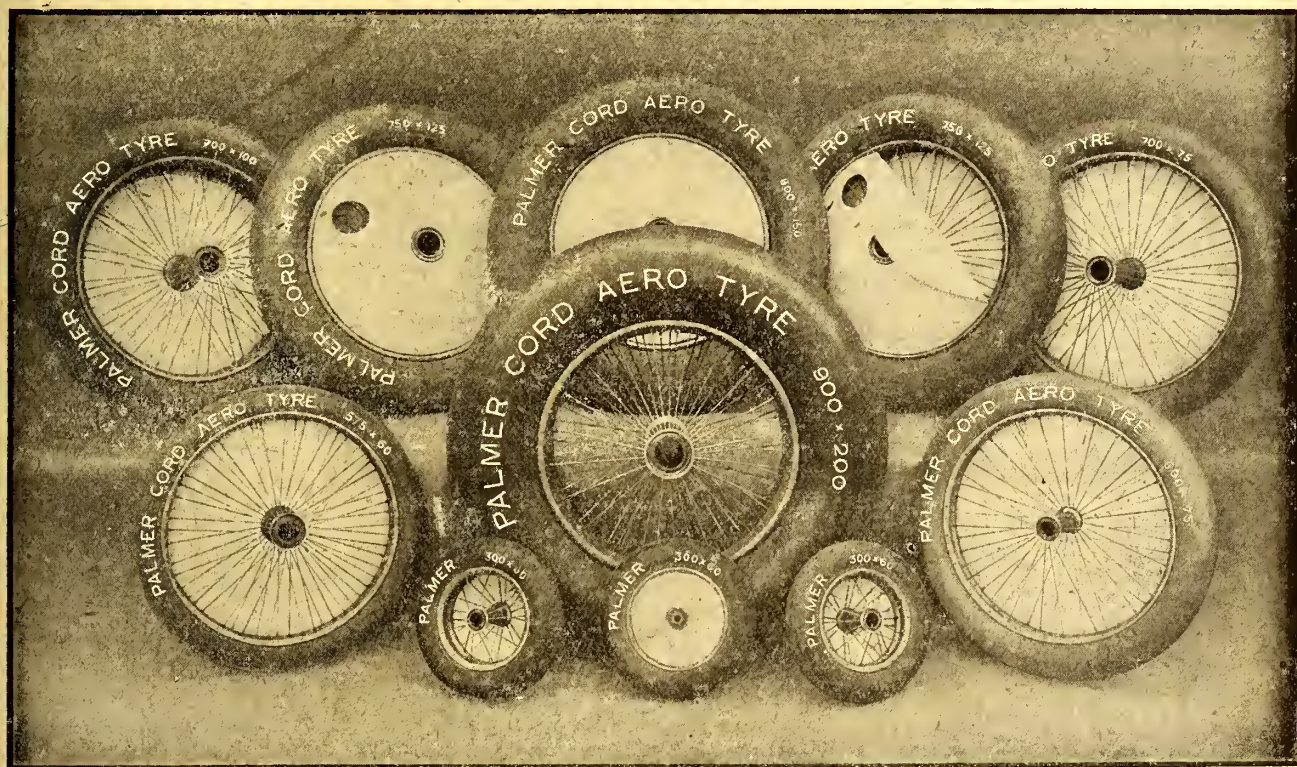
(Continued on page 1400.)



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"	17	72.39	12.7	Central	"	*80	178.	44.45	132/46	"	33	150.	38.09	Central
450x60	30	89.	31.75	Central	"	*91	178.	31.75	132/46	"	66	178.	38.89	132/46
575x60	14	150.	38.09	104/46	"	*98	178.	44.45	Central	"	96	178.	55.	132/46
"	21	160.	28.	Central	700x100	2	185.	55.	135/50	"	8	185.	55.	135/50
"	34	150.	31.75	104/46	"	4	185.	55.	Central	800x150	10	185.	55.	Central
650x65	9	178.	44.45	132/46	"	18	178.	44.45	132/46	"	†36	185.	55.	135/50
"	20	178.	38.09	132/46	"	26	150.	40.	Central	"	†40	185.	60.32	135/50
"	75	178.	31.75	132/46	"	33	150.	38.09	Central	"	42	185.	60.32	125/60
600x75	14	150.	38.09	104/46	"	66	178.	38.89	132/46	900x200	47	185.	55.	125/60
"	21	160.	28.	Central	"	96	178.	55.	132/46	"	97	250.	65.4.	Central
"	34	150.	31.75	104/46	750x125	2	185.	55.	135/50	1100x200	52	185.	55.	116/69
700x75	9	178.	44.45	132/46	"	4	185.	55.	Central	"	57	185.	55.	Central
"	20	178.	38.09	132/46	"	18	178.	44.45	132/46	"				

*Wheels Nos. 80, 91 and 98 are fitted with a wider and stronger rim, and the 700x75 tyres when fitted to this rim caliper 83 m/m.

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The British Aircraft Industry.

BY CHARLES L. FREESTON.

XVIII.—SHORT BROTHERS.

The aeroplane is now a commonplace, but who is there among the older members of the Royal Aero Club who does not remember the exhibit of Short Brothers at the first Olympia (Aero) Show? The chief item of the display was a skeleton biplane, and not only was it impressive as a beautiful piece of carpentry, but it provided to probably ninety-nine per cent. of the visitors their first opportunity of seeing how an aeroplane was fashioned, and how pre-eminently it embodied the ideal sought for in so many fields—namely, lightness with strength.

WANTED—A MOTOR.

But in those days it was one thing to construct an aeroplane and quite another to equip it with an engine. The machine in question was built to the order of Mr. Frank McClean; and, as no aeromotors were then available, he bought a Nordenfeldt chassis and removed the engine. Of course, for air purposes, it was inordinately heavy, as even a modern motor-car engine would be. The aeroplane had no running wheels and was started, like the original Wright, from a derrick; but even with this initial impetus it never lifted its own weight to any practical effect, and its "flights" were measured with a foot-rule.

Two facts of interest, however, in connection with this initial product are worthy of mention. Both the propellers and the camber of the wings were of Mr. Horace Short's own design. The former earned the commendation of Sir John I. Thornycroft, while the design of the ribs and spars was very much akin to those of the Short planes of to-day. It may be added that Mr. Horace Short elected to use spruce, and that is still the staple material in aeroplane construction.

THE SHORT-WRIGHTS.

The Wright Brothers were now actively at work in France, and, as many Britons went over to witness their efforts, it resulted that they received orders from those who were sufficiently far-seeing to recognise the possibilities of flight, and enterprising enough to aspire to become aviators themselves forthwith.

The famous pioneers, however, had no means of duplicating their own machines, and on the advice of Mr. Griffith Brewer, they asked Messrs. Short Brothers to undertake the task of completing the orders of the British enthusiasts. Six machines were laid down accordingly, the patrons being Mr. Frank McClean, the Hon. Maurice Egerton, the Hon. C. S. Rolls, Professor Huntington, Mr. J. P. C. Moore-Brabazon, and Mr. Alec Ogilvie.

A MOVE TO LEYSDOWN.

By this time the firm had established itself in new works at Leysdown, Isle of Sheppey, having previously been engaged in the building of spherical balloons at Battersea, as official balloon-makers to the Aero Club. Leysdown was the most desolate spot imaginable, entirely devoid of means of communication, and even the girls who were employed at the workshops had to walk across the marshes in jack-boots.

But the site was chosen, of course, not from manufacturing considerations, but because of its suitability, more or less, as a flying ground.

EARLY DIFFICULTIES.

No greater contrast could be afforded between present-day methods, when aeroplanes in thousands are being built on all sides from blue prints, and the difficulties which had to be overcome in completing the order for the Wright machines. The Wright Brothers had no drawings whatsoever, so Mr. Horace Short went over to Pau and made sketches of every detail himself, returning to Leysdown with his pockets bulging with rough drawings. When these were worked up in the draughtsmen's office they constituted the first scale drawings that had ever been made of the Wright machine, which had been built solely by rule - and - thumb methods.

These handicaps notwithstanding, the six machines were built in a manner which pleased the Wright Brothers in no small measure, and their justification was all the greater, because the copies that they had had made in France and Germany were not to their liking. All the six machines built at Leysdown were flown with success.

A HISTORIC MACHINE.

Mr. Horace Short, however, was not content to rest as a copyist alone. He advised the Wrights to add a tail to their machines, and himself started to construct a very big machine for Mr. Moore-Brabazon with built-up cambers, and with a tail.

This was the historic machine on which Mr. Moore-Brabazon won the "Daily Mail" prize of £1,000 for the first aeroplane of British origin to complete a circuit of one mile. On the day on which the feat was performed the machine had been through no trials, and had not made a single turn.

Great anxiety was manifested accordingly by all concerned as to what the machine would do when it reached the end of the first straight. Mr. Horace Short was so overcome by the tension of the situation that he went indoors and busied himself in his office. However, the machine did a very nice bank, and the



Mr. H. Oswald Short.

workmen all cheered lustily, and, in the end, the accomplishment of the required one-mile flight reflected enormous credit on Mr. Moore-Brabazon, the Short machine, and the Green engine alike, and marked an abiding red-letter day in British aviation.

About this time, by the way, the Short works were engaged upon the production of valves and other details for the "Mayfly," the ill-fated airship which was then under construction.

MR. ROLLS' MACHINE.

For the next Aero Show at Olympia Messrs. Short Bros. designed and built a machine of a type very similar to that of Mr. Moore-Brabazon, but much smaller, for the Hon. C. S. Rolls. It was fitted with wheels, as well as landing skids, the wheels being made to draw up after the machine had got off the ground. The engine was a Bariquand and Marre.

THE EASTCHURCH FACTORY.

Meanwhile, it had been realised that Leysdown was by no means ideal as a flying ground, for though very flat, and apparently spacious, it was full of dykes, and really afforded very little landing room. Its inaccessibility, moreover, made it unsuitable from the manufacturer's point of view, as it was difficult to get workmen to the spot. The Short Brothers hunted around, therefore, and discovered Eastchurch, to the possibilities of which they drew the attention of Mr. Frank McClean. He purchased the site forthwith, and presented its use to the Aero Club, while the Brothers Short transferred their works bodily to the new venue, and boldly put all their capital into the Eastchurch factory.

Here they built machines for Mr. Cecil Grace, Mr. Rolls, Mr. Egerton, and Mr. G. C. Colmore, all of the box-kite type. Mr. Colmore, it may be mentioned, learned to fly on one of the new Shorts in half an hour. Mr. Egerton had three machines built for him, and it was on one of these that he experimented with wireless telegraphy, and with encouraging success.

PIONEER AND BENEFACTOR.

Throughout this period Mr. Frank McClean played the part of patron saint to the firm, having four machines built to his order, at a time when Government recognition was practically a minus quantity. What with the purchasing of aerodromes and the ordering of machines Mr. McClean must have spent a very large sum of money on aviation in those days, and flying in this country owes no small debt to his combined munificence and foresight.

THE FIRST NAVAL PILOTS.

It was on the box-kite machines that the Admiralty allowed its first naval pilots to be taught the art of flight at Eastchurch by Mr. G. B. Cockburn—namely, Lieuts. Samson, Longmore and Gregory, R.N., and Lieut. Gerrard, R.M.L.I. The quartette were diligently instructed also in the theoretical aspects of flying by Mr. Horace Short, who gave lectures in one of the sheds. On one occasion he drew such a vivid picture of what a nose-dive was like that Lieut. Samson—as brave a man as ever flew—facetiously observed that it gave him "cold feet," and nearly made him send in his resignation on the spot.

A FIVE HOURS' FLIGHT.

As illustrating the capabilities of the Short machine, and Lieut. Samson's early prowess, it may be mentioned that the latter put up a five hours' continuous flight at Eastchurch, which, in those days, was in every way a remarkable performance. He flew round and round the aerodrome, and, lest his watch should stop, the watchers on the ground chalked up his time to make sure that he did not come down before completing the five hours which he had set out to achieve.

THE GENESIS OF THE SEAPLANE.

All the four naval pupils turned out excellent pilots, with the result that other officers were sent down by the Admiralty for instruction, and, eventually, the Naval Air Service Flying School was established, and afterwards became the Royal Naval Air Service. Meanwhile, however, Lieut. Longmore and Mr. Oswald Short had been conducting experiments on the water. They fitted a machine with cigar-shaped pontoons, made of rubber fabric, and weighing only about 8 lb. each, and with these made landing trials on the water.

In the first instance scepticism reigned supreme, and all the critics who came down to witness the experiments shook their heads and said that the pontoons were not strong enough. As a test, therefore, one was dropped from a height of 50 feet with a huge weight attached to it, and it stood up perfectly, owing to its sound construction. The first machine to which the pontoons were fitted weighed 1,700 lb. Lieut. Longmore flew it with success, and thus the seaplane was created as a type. Up to that time the possibility of alighting on the water without smashing the machine had been seriously questioned.

AT THE NAVAL REVIEW.

What followed was even more convincing, and the entire practicability of the seaplane as a type was established at Weymouth during a Naval review. Two machines were sent down for demonstration purposes. One was fitted with both wheels and

floats, and this was flown by Lieut. L'Estrange-Malone from the deck of H.M.S. "Hibernia," which had had a special stage erected for the purpose of "talking off."

The other machine was the famous "No. 10." It had floats only, designed by Mr. Oswald Short, and, to all intents and purposes, was similar to the Short seaplane of to-day; that is to say, it was a tractor, with enclosed fuselage. The floats were made of wood and steel, covered with canvas, and were both strong and light. The bottoms were stepped, and a curious feature, now discarded, was the provision of louvres above the steps, as it was thought that the latter might create a vacuum which would put a drag upon the machine. This precaution, however, was found to be superfluous, and no air tubes are now employed.

LIEUT. SAMSON'S GREAT ACHIEVEMENT.

The redoubtable Lieut. Samson flew Lieut. Malone's machine from the deck of the "Hibernia," but scored his chief success with "No. 10." Before she went to Weymouth there had only been time to give her one small trial at Grain, and all responsible for her building had a very anxious time when she appeared before the fleet. Lieut. Samson plunged boldly into the sea, and tore along with a tremendous wake, but the machine was a long time before she would leave the water. Capt. Gerrard and Mr. Horace Short, who were watching from the quay, being meanwhile on tenter-hooks lest she should not rise.

Then they saw him heading directly for a man-of-war, in a way that suggested the intention of either "going over or going through." As a matter of fact, she rose beautifully in the nick of time, passed over the ship, and then flew all round the fleet, and the achievement created no small stir in naval circles.

TO MEET THE KING.

A much more daring performance, however, was carried out by Lieut. Samson on the following day, for he flew out to meet the King under conditions that were the reverse of favourable. Mr. Oswald Short was on the bridge of the "Hibernia," and the wind was howling so and there was so much mist that he thought that Lieut. Samson would not dare to go up. Then the intrepid pilot was seen emerging through the mist, flying over a low cloud.

No wonder Mr. Oswald Short remarked to me a day or two ago that he had a very tender spot in his heart for Commander Samson, remembering the pluck which he invariably displayed in the early days. He would always go up himself on any machine about which his men had doubts or fears, and to those who knew him then his record in the war has been nothing in the nature of a surprise.

ADMIRALTY INTEREST.

The next machine to be built had a 50-h.p. Gnome motor, and proved a very good performer. Several admirals and Commodore Sueter came down to view her flights, and were much impressed thereby, especially as the majority of the visitors saw a machine rise from the water for the first time. Mr. Gordon Bell was the pilot, and he flew very low right over the admirals' heads.

Orders for seaplanes now came in from the Admiralty, and in addition the firm built a number of school machines. Some of these, which were old tractors converted into land machines, were among the first aeroplanes to be sent out to the front at the opening of the war. Some pusher machines were also sent out, and one of these was flown by Commander Samson.

BIG MACHINES.

The first new development after the war was a tractor seaplane with a 160-h.p. Gnome engine, and it proved a great success. A big bomb-dropping land machine was also built, but for the most part the energies of the firm have been devoted to seaplane work on a large scale, at Eastchurch and Rochester alike. The Rochester works were established in 1914, but Eastchurch still remains the main source of output, while the Battersea works, under Mr. Eustace Short, are devoted to the production of spherical balloons.

THE FOLDING WING.

It is giving no war secret away to say that there is a greater number of Short seaplanes in use than of any other type. First in the field, they have maintained their reputation throughout for soundness of construction, while they have proved of inestimable service to the country in one paramount respect, and that is the folding wing. Quite apart from the immense advantage which this invention conferred in the way of sea transport, the money saved in the building of seaplane sheds of colossal size has by this time amounted to a colossal sum.

The imagination reels at the thought of the floor space that would be required for the housing of machines of over eighty feet span if the wings were incapable of being swung round in the simple but effective fashion which was invented by Mr. Horace Short in August, 1912, though not actually patented until 1913. In land transport, too, the system has proved invaluable, and it is a common occurrence for Short seaplanes to be towed from Eastchurch to Queenboro' along nine miles of road.

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Six United States Army Wing Sections.

BY CAPTAINS EDGAR S. GORRELL AND H. S. MARTIN, U.S.A.*

(Reprinted from "Aviation," New York, April 15th, 1917).

These wing sections, developed by the Aviation Section of the Signal Corps, offer considerable interest both from an aerodynamical and a structural point of view. Developed partly from the latter point, they have proved to be efficient and show very satisfactory lift coefficients.

STRUCTURAL DEVELOPMENT OF THE SECTIONS.

In Fig. 1 are shown the dimensioned outlines of the six sections tested. Some of the considerations involved in developing the sections are interesting.

The U.S.A. 1 is a modification of the Clark aerofoil (characteristics and dimensions of which are described in Hunsaker's "Dynamical Stability of Aeroplanes"). This was an excellent high speed wing with a maximum lift-drift of 18. By increasing the depth at the position of rear spar, it was made structurally much more practical, the maximum lift was increased and the maximum lift-drift ratio only reduced very slightly.

The U.S.A. 2 has the same upper surface as the R.A.F. 3, but the lower surface has been modified and deepened from a structural point of view, without any loss from the aerodynamical point of view.

The U.S.A. 3 and U.S.A. 4 are both modifications of the U.S.A. 2. In the first section, the nose of a 30-in. chord has been moved forward $\frac{1}{8}$ -in. and the ordinates of the first fifth of the 30-in. chord spread out accordingly. In the U.S.A. 4, the nose of a 30-in. chord has been moved back $\frac{1}{8}$ -in. and the ordinates of the first fifth of the 30-in. chord crowded out accordingly.

The U.S.A. 5 was skilfully developed from both structural and aerodynamic considerations, with very satisfactory results.

RESULTS OF TESTS.

The tests were conducted under the standard conditions. Results for K_y , K_x , L/D and the centre of pressure motion are given in Table 1, and in the curves of Figs. 2, 3 and 4. The wind tunnel speed was 30 m.p.h. in every case, and the models 18-in. span by 3-in. chord—the dimensions generally employed, and useful on that score for purposes of comparison.

The National Physical Laboratory results, as published in the British Reports, are based on LV (chord of wing in feet \times velocity of relative wind in feet/seconds) values of 6.3. In Eiffel's large laboratory with greater wind speeds the values of LV range from 16 to 40. The Institute tests are conducted with an intermediate value of 11 for LV . It is, therefore, not possible

to make strictly accurate comparisons without further tests which are now in progress at the Institute. It is, however, perfectly clear that, apart from the good structural features, the sections have remarkably good aerodynamic properties.

In Table 2, comparative figures for the six sections are set out in accordance with the plan employed in the Course in Aerodynamics and Airplane Design ("Aviation and Aeronautical Engineering," October 1st, 1916), together with values for the R.A.F. 3, R.A.F. 6, and Eiffel 32; the drift and L/D values for the latter being subject to revision as stated on completion of above tests.

For none of the wings does the maximum K_y fall below 0.003, except almost negligibly so for U.S.A. 6. For all the wings, there is a wide range of working angles. None of them exhibit a sharp drop at the burble point. With the exception of U.S.A. 4, they all have good maximum values of L/D at the small value of $K_y = 0.00386$. From the centre of pressure curves in Fig. 4, it is seen that none of the wings may be said to be longitudinally stable, but none of them have a violent centre of pressure motion within the usual range, and with modern non-lifting tail surfaces, no difficulty would be met in securing longitudinal stability.

It is noteworthy that the U.S.A. 4 has a higher maximum lift coefficient than almost any wing section tested, — 0.00364, compared with 0.00347 of the R.A.F. 3. It should have an L/D of approximately the same value and is far better structurally. This wing would seem to be particularly suitable for very heavy machines, such as seaplanes.

U.S.A. 1 has a higher lift than Eiffel 32—namely, 0.00318, compared with approximately 0.00280, and its maximum L/D of 17.8 would, in the Eiffel tunnel, probably exceed the 18.2 of the French wing. Although for small values of K_y and high speeds, the Eiffel 32 has better efficiency, U.S.A. 6, also with a higher maximum lift, would compare most favourably in a high speed machine with any French wing of which data has hitherto been published. For pursuit machines, the choice between U.S.A. 1 and 6 would be very close. U.S.A. 1 would give a better landing speed and U.S.A. 6 is slightly more efficient at low angles and high speeds.

U.S.A. 2 and 3 would be good all round wings apparently slightly better than the R.A.F. 6.

An interesting feature of the series is the successful employment of heavy camber on upper and lower surfaces. It has been commonly accepted that heavy camber meant increase in lift with corresponding decrease in efficiency, while lightly cambered wings would give high efficiency but low lift. With skilful design, it is apparently possible to retain both good features.

Table 1, and Figures 1, 2, 3, and 4 will be found on the following pages.

U.S. GOVERNMENT AIRCRAFT INSPECTORS.

The United States Civil Service Commission is conducting examinations to fill the position of assistant inspector of engineering material for aircraft. There are at present six positions open, paying from 4.48 dols. to 5.04 dols. per day, and the Commission, due to the lack of eligibles and urgent needs of the Service, is receiving applications at any time, rating examination papers when received, and will make appointment with the least possible delay.

Competitors must have had at least one year's experience as machinist in a factory constructing gas engines for automobile or aeroplane use, or as inspector of aeroplane or automobile engines, or one year's actual experience in flying. In the examination, experience counts for sixty points, and education of a technical nature for forty points out of a total of 100.

A MANUFACTURERS' CLEARING-HOUSE.

The Aircraft Manufacturers' Association has opened executive offices at 501, Fifth Avenue, New York City, and is now taking measures to obtain definite information on the resources of manufacturers and the producers of raw material in connection with materials entering into the construction of aircraft of all descriptions.

Manufacturers of small parts, fittings, etc., and mills producing fabrics suitable for wing covering are invited to submit samples and catalogues, together with a statement of their ability to produce the various products, which is to be placed on file with the Association.

One of the objects of the Association is to create a clearing house for the exchange of ideas and to obtain and standardise small parts and equipment, and in this work it is co-operating with the National Advisory Committee for Aeronautics.

This strikes one as being more sensible than leaving the creation of a clearing-house to a lot of inefficient or incompetent officials.

Aero-foil	LV = chord of wing in ft. \times relative wind in ft./sec.	Maximum L/D		Maximum K_y		$K = 0.0086$	
		Angle in degrees	K_y	L/D	Angle in degrees	K_y	L/D
U.S.A. 1	11	3.0	.00133	17.8	15.0	.00318	9.6
U.S.A. 2	11	4.0	.00169	16.3	15.0	.00337	9.3
U.S.A. 3	11	4.0	.001704	16.4	13.6	.003243	9.8
U.S.A. 4	11	4.0	.00177	15.88	15.0	.00364	9.1
U.S.A. 5	11	3.0	.001565	16.21	14.0	.003285	9.25
U.S.A. 6	11	3.0	.001455	17.4	14.0	.00298	7.37

Foreign Sections

Aero-foil	LV = chord of wing in ft. \times relative wind in ft./sec.	Maximum K_y		Maximum L/D		$K_y = .00086$	
		Angle in degrees	K_y	L/D	Angle in degrees	K_y	L/D
Eiffel 32	49	....	0.00280	...	3.0	0.00103	18.2
R. A. F. 3.	6.3	15.7	0.00347	7.8	5.0	0.00195	14.3
R. A. F. 6.	6.3	15.4	0.00310	7.8	4.9	0.00157	14.6

TABLE 2.

* By permission of Professor C. H. Peabody, Professor of Naval Architecture, in Charge of Department of Aeronautical Engineering, Massachusetts Institute of Technology. Abstract by Alexander Klemin and T. H. Huff.

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TABLE 1

U. S. A. 1.				U. S. A. 4							
L of	K_y	K_z	L/D	Distance of C. P. from leading edge, in fractional part of chord.		L of i	K_y	K_z	L/D	Distance of C. P. from leading edge, in fractional part of chord.	
— 4°	.000399	.0001515	2.64	.....		— 4°	.0001231	.0001640	— 0.75	.....
— 2°	.000156	.0000905	1.72	.....		— 2°	.0005200	.0001150	4.52	.670	
— 1°	.000432	.0000700	6.15	.620		— 1°	.0007650	.0001078	7.11	.525	
0°	.000721	.0000653	11.00	.530		0°	.0009750	.0001032	9.44	.461	
1°	.000936	.0000670	14.00	.463		1°	.0011840	.0001002	11.80	.416	
2°	.001146	.0000683	16.60	.415		2°	.0013820	.0000995	13.90	.388	
4°	.001510	.0000860	17.50	.340		4°	.0017700	.0001115	15.83	.347	
6°	.001878	.0001158	16.20	.316		5°	.0019800	.0001340	14.80	.310	
8°	.002230	.0001558	14.30	.303		8°	.0025600	.0001900	13.50	.298	
10°	.002580	.0002055	12.60	.290		10°	.0029900	.0002555	11.70	.273	
12°	.002910	.0002595	11.20	.283		12°	.0033100	.0003100	10.67	.276	
14°	.003165	.0003040	10.40	.274		14°	.0036000	.0003545	10.15	.276	
16°	.003165	.0003710	8.50	.276		16°	.0036150	.0004430	8.15	.276	
18°	.003080	.0005520	5.60	.310		18°	.0034700	.0005580	6.22	.303	
20°	.002882	.0003500	3.40	.360		20°	.0031000	.0007640	4.06	.335	

U. S. A. 2				U. S. A. 5							
L of i	K_y	K_z	L/D	Distance of C. P. from leading edge, in fractional part of chord.		L of i	K_y	K_z	L/D	Distance of C. P. from leading edge, in fractional part of chord.	
— 4°	.000228	.000147	— 1.55	.....		— 4°	.000326	.0001500	— 1.58	.....
— 2°	.000363	.000108	3.37	.733		— 2°	.000346	.0000948	3.64	.753	
— 1°	.000625	.0000943	6.64	.522		— 1°	.000636	.0000830	7.67	.566	
0°	.000862	.0000872	9.88	.445		0°	.000910	.0000741	12.28	.498	
1°	.001075	.0000816	13.26	.388		1°	.001145	.0000803	14.28	.441	
2°	.001292	.0000848	15.22	.352		2°	.001355	.0000863	15.72	.415	
4°	.001678	.0001027	16.34	.317		3°	.001565	.0000966	16.21	.377	
6°	.002090	.0001320	15.80	.292		4°	.001740	.0001092	15.98	.348	
8°	.002432	.000175	13.83	.276		5°	.001950	.0001290	15.35	.337	
12°	.003179	.000270	11.75	.255		8°	.002470	.0001830	13.52	.315	
16°	.003362	.000410	8.20	.247		10°	.002870	.0002380	12.08	.303	
18°	.003100	.000701	4.41	.228		12°	.003130	.0002890	10.81	.300	
20°	.002770	.000871	3.18	.230		13°	.003240	.0003290	9.84	.298	
						14°	.003285	.0003545	9.25	.283	
						15°	.003235	.0003910	8.28	.292	
						16°	.003205	.0004210	7.63	.298	
						18°	.003150	.0006900	4.57	.330	
						20°	.002790	.0008200	3.41	.368	

U. S. A. 3.				U. S. A. 6							
L of i	K_y	K_z	L/D	Distance of C. P. from leading edge, in fractional part of chord.		L of i	K_y	K_z	L/D	Distance of C. P. from leading edge, in fractional part of chord.	
— 4°	.000506	.0001589	— 3.19	.....		— 4°	.000276	.0001395	— 1.98	.....
— 2°	.000420	.0001052	3.99	.676		— 2°	.000272	.0000793	3.43	.910	
— 1°	.000692	.0000845	8.20	.482		— 1°	.000567	.0000671	8.46	.600	
0°	.000928	.0000935	11.10	.403		0°	.000845	.0000650	13.00	.498	
1°	.001123	.0000856	13.10	.353		1°	.001057	.0000668	15.88	.458	
2°	.001310	.0000889	14.75	.323		2°	.001255	.0000733	17.15	.439	
3°	.001508	.0000893	16.16	.295		3°	.001455	.0000858	16.98	.402	
4°	.001704	.0001073	15.88	.280		4°	.001662	.0000976	17.05	.323	
5°	.001919	.0001180	16.18	.260		5°	.001846	.0001121	16.48	.335	
8°	.002520	.0001823	13.82	.230		8°	.002415	.0001665	14.50	.322	
10°	.002905	.0002290	12.70	.220		10°	.002650	.0002160	12.27	.305	
12°	.003160	.0002830	11.15	.208		12°	.002861	.0002820	10.15	.310	
13°	.003235	.0003142	10.30	.204		13°	.002910	.0003260	8.94	.310	
14°	.003240	.0003410	9.50	.197		14°	.002980	.0004050	7.37	.310	
15°	.003215	.0003780	8.50	.197		15°	.002966	.0005390	5.58	.323	
16°	.003155	.0004460	7.02	.197		16°	.002900	.0006380	4.55	.346	
18°	.003125	.0006620	4.73	.236		18°	.002790	.0007900	3.53	.365	
20°	.002889	.0008570	3.37	.266		20°	.002585	.0009000	2.88	.388	

L of i = Angle of wing chord to wind.

 K_y = Lift coefficient in lbs./sq. ft./MPH. K_z = Drift coefficient in lbs./sq. ft./MPH.

L/D = Ratio of lift to drift.

Model: Size, 13" x 3" (54 sq. in.). Material, Brass.

Velocity of wind: 30 MPH.

Density of standard air: .002376 lb./cu. ft.

A PIECE OF HISTORY.

Mr. H. Wallace Simpson, of Bournemouth, writes apropos Mr. Gordon England's early experiences with the Weiss monoplane, that this machine while at Littlehampton was fitted with a 25-h.p. 4-cyl. Warren-Simpson engine, which was made at Ipswich to the designs of Mr. Simpson himself.

This engine took a Weiss monoplane along at 40 miles an hour, as timed over a measured strip of beach. After some experimenting the machine did get off the ground, and it promptly turned a somersault and buried the engine in the sand. As Mr. Simpson pathetically remarks, "incidentally, it at the same time buried my hopes of success," as he had not at the time the wherewithal to build another engine. Evidently the Warren-Simpson engine had distinct possibilities.

THE "AUSTIN ADVOCATE."

The "Austin Advocate" for March and April contains the first two instalments of an interesting article by J. D. N., entitled "Early Experiences in the Air." One may be permitted to remark that J. D. N. has been in touch with practical aviation from the very earliest days, and is a successful designer and constructor of aeroplanes. In the April issue he describes an amusing balloon trip from St. Cloud across Paris with a very amateur crew, when, on several occasions, bags of ballast had, perforce, to be slung over the side to save collision with such buildings as the Eiffel Tower or other obstructions.

Readers who are interested should write to the Austin Motor Co., Ltd., Northfield, Birmingham, and ask for a copy of this very interesting monthly.

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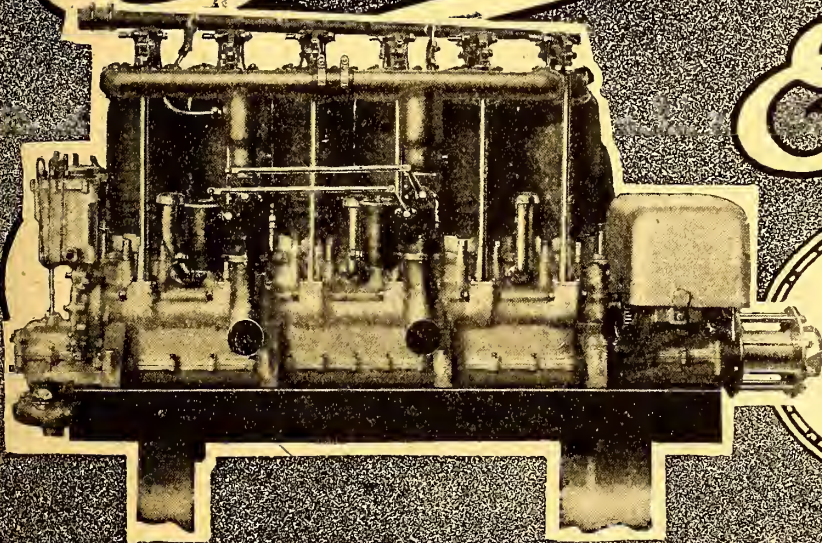


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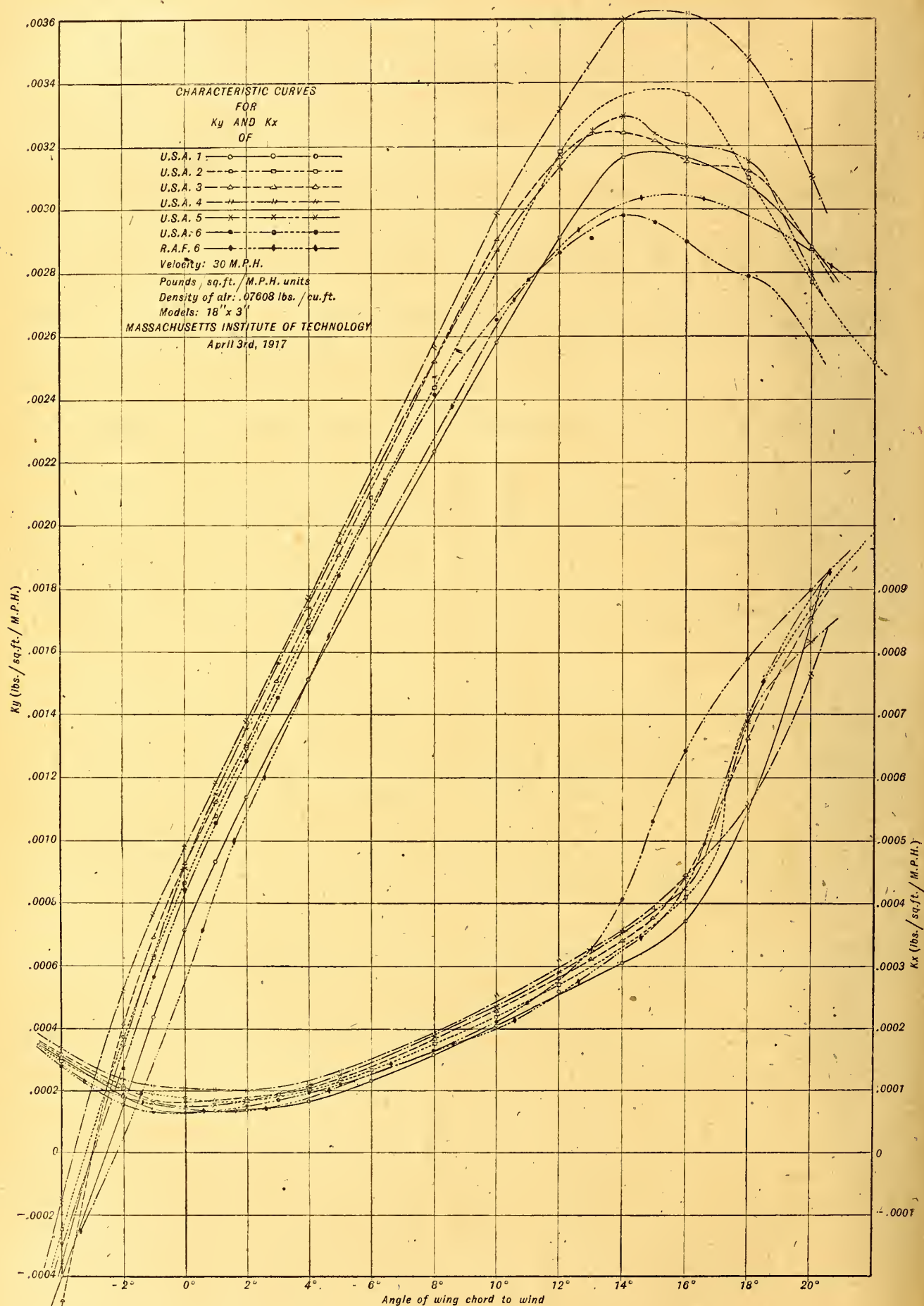
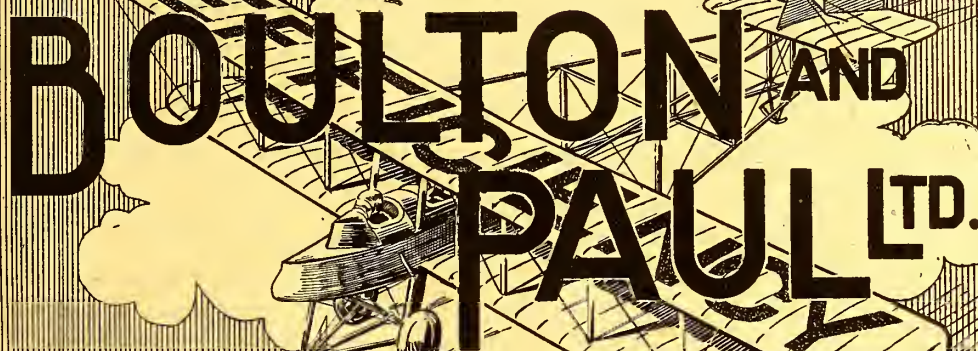


FIG. 2

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FIG. 3

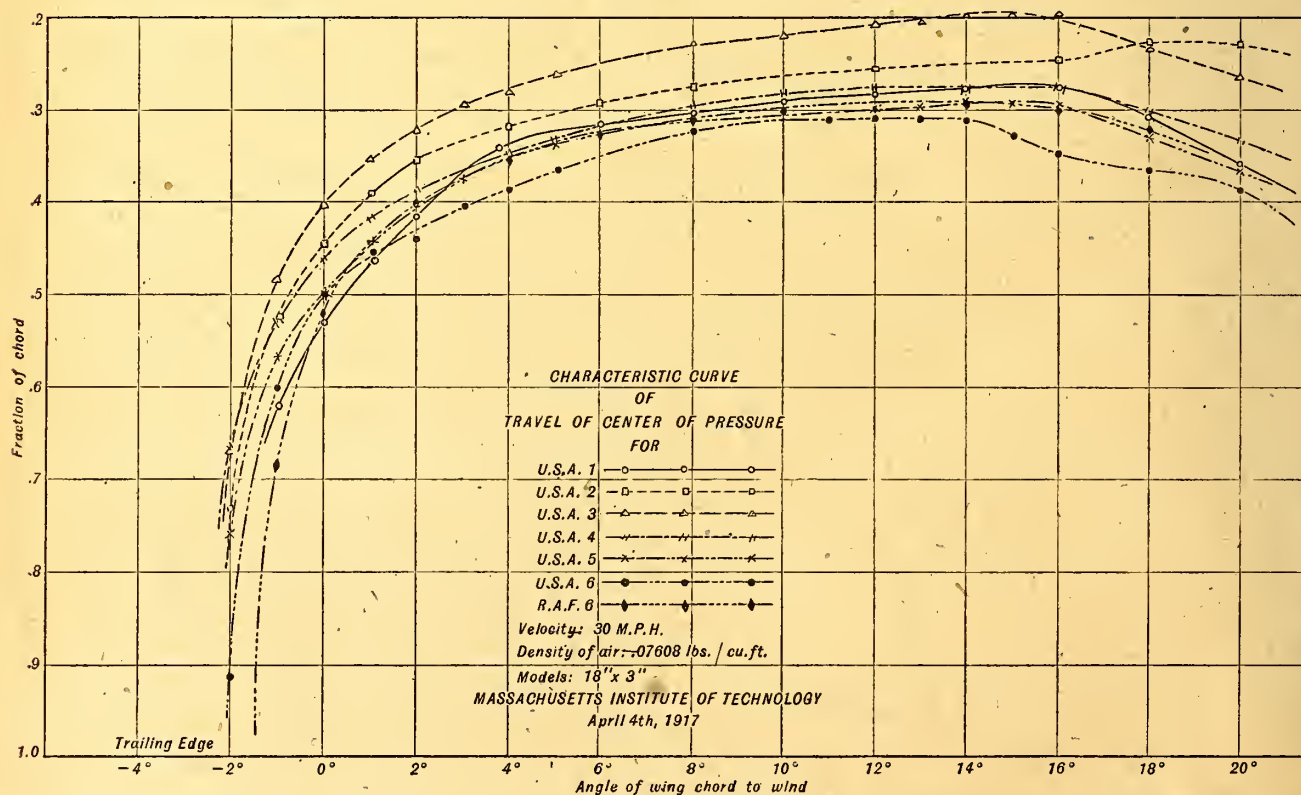
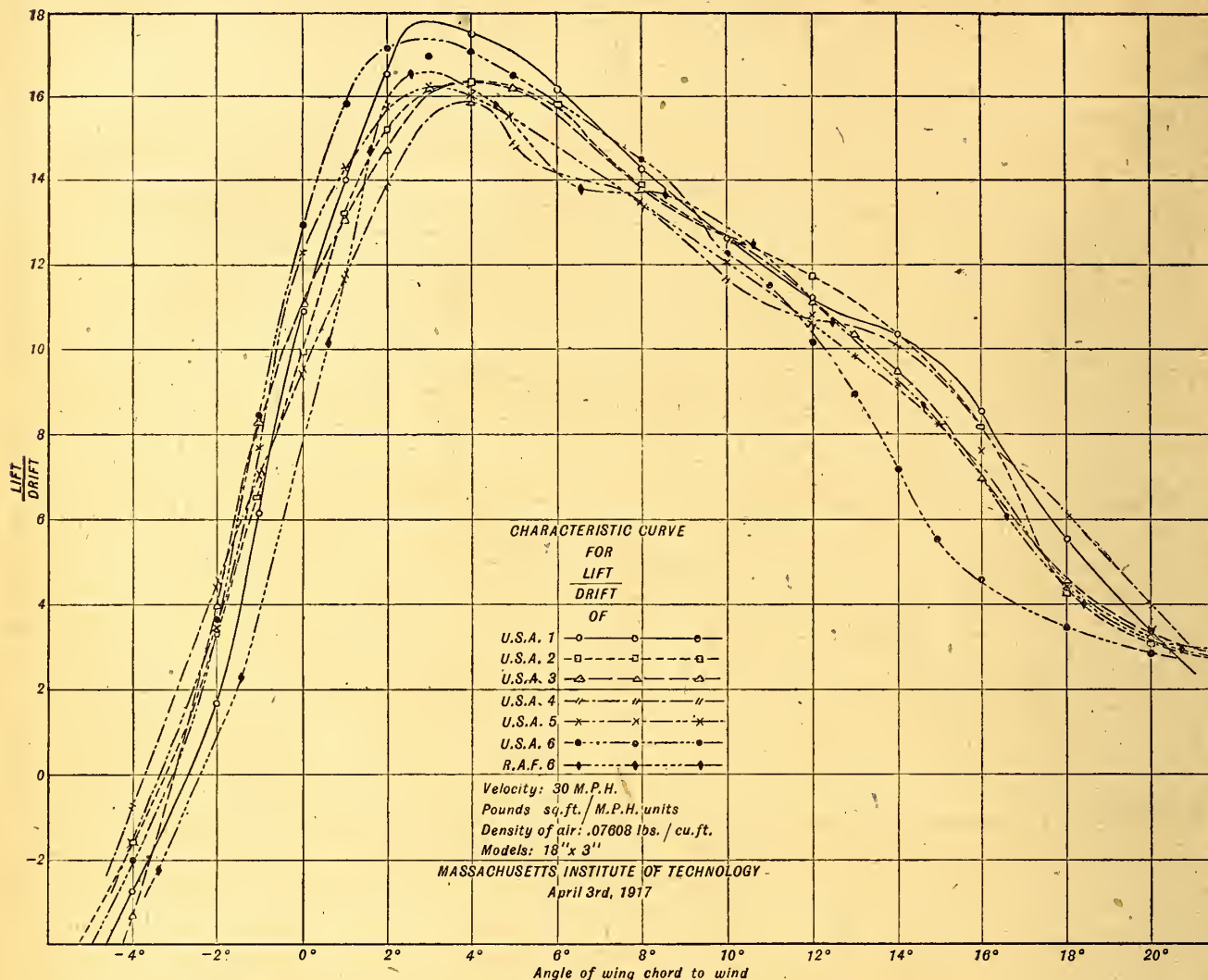


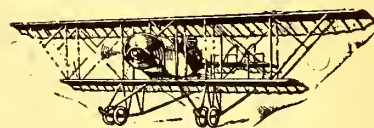
FIG. 4

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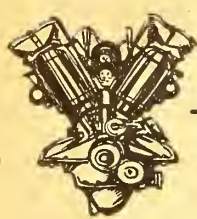
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AERO-MOTORS

IN KIND AND CONSTRUCTION

By Geoffrey de Holden-Stone



LUBRICATION—AND THE BENCH-TEST.

Extreme as the statement may sound, the lubrication of any internal combustion motor is the most important of its physical functions. For induction, exhaust, even ignition, may each be inefficient in their degree; and that degree will soon be apparent enough, though the precise reason why may remain obscure. And if that degree of inefficiency exceeds a certain point, the motor will either stop at once or refuse to run at all. Neither of which contingencies involves any risk.

Whereas, if lubrication be defective, or the design of the system such as to make it even insufficient for all emergencies—and a little over to make sure—the motor may run extremely well, for a time. A time just long enough to obscure the actual risk that exists.

No doubt your "practical man"—whose acquaintance with motor-practice and use probably ceases at the packing-room door—will say that all this is nonsense; or, at best, a mere labouring of the obvious. "How can a lubrication system be defective?"—he will ask, "and escape immediate recognition or the fact on the test-bench?"

Him I will answer, "Very easily, given only a few readily possible, not to say frequent, conditions." To begin with, those of the test-bench. Motors are built, primarily, as commercial and not laboratory propositions. Naturally, therefore, all the conditions of the test-bench are purposely made such as to enable the motor to do its best work, if it can. That is, they are favourable.

HOW IT WORKS OUT.

The carburation will be adjusted—as near as can be told beforehand—exactly right; subsequently trimmed to that very degree, and kept there. The right grade of lubricant will have been chosen, and no other will be used. And, again, the whole of the cooling arrangements will be devised so that no failure can occur from that cause.

Then the apportioned load—or the actual work-test end of the business—and all the appurtenances thereof, will be appropriately devised so as to show the projected commercial result: such an amount of h.p. continuously delivered for so many hours. In fact, if this were not done, there would be no getting any accurate data as to the actual horse-power developed, for such and such a consumption of fuel and lubricant: for the individual motor or for the series.

Above all, since the maker hopes to sell one or both—very likely to fulfil a contract—he is certainly not going to test that motor to destruction, nor yet destructively. Nor to anything approaching detriment to such an expensive production. And in the use of a motor intended for aviation, there is nothing similar to a road-test to expose the latent defect. The utmost that can be done is to ring the changes on three or four propellers. And from that result, the most appropriate—that is work-favourable—type will be chosen as the recommended pattern.

THE CONTRAST OF SERVICE.

But the moment the motor passes into service, all these conditions are directly reversed. For all conditions of usage—to say nothing of Service usage—positively conspire to destruction. The root-fact is first, that such conditions cannot be foreseen or prevented; which is fortunate, perhaps, in the long view of things, though deadly to the individual motor.

Another fact—hardly less basic, as it can only be modified by a radical improvement in the actual flying-machine—is that an aero-motor runs all out, and must do, practically all the time it is running at all. If it does not or cannot, it is no good as an aero-motor. It will simply let the aeroplane down, and probably kill the pilot. Which explains why aero-motors are such tremendously refined—at least ostensibly—and costly productions.

Incidentally, too, why their design and construction can have but little practical bearing on road-motor construction after the war. One might as well talk of the design and make of trench-boots improving that of dress-boots: both "footwear," nevertheless.

WHAT THE ACTUAL CONDITIONS ARE.

In short, the aero-motor is doomed to destruction in any case; and only to work its best and hardest as long as it lives. It is even risky to endeavour to make it live an hour longer than it seems inclined to; exigencies of Service apart. There is, indeed, only one rule for its care and upkeep: to expect its entire or partial destruction hourly, to anticipate that occurrence by

keeping the motor in perfect fettle: and never to give the smallest part of it the benefit of any doubt.

Yet so far, merely as far as the Service conditions of any home-station apply. Even so, all sorts of contingencies arise. There is the mechanic, and his skill and general notions of upkeep as the lowest common factor of things aeroplane. There is the carburation control by the pilot, who may have been anything but a motorist, or have no sympathy for mechanism, much less acutely trained understanding.

There is, too, the chance of indifferent petrol, or the wrong kind of excellent lubricant being delivered. Or of some superior person desiring to experiment with propeller-changes. Yet at the front there is not only the possibility of each and all these adversities, but also the contingency of radiators shot through, and twenty other power-plant casualties which the motor must, nevertheless, be able to survive, and get home in their despite.

There is no "I cannot," on Service. Only "You must," for motor and man alike.

AND THE NECESSITIES THEREOF.

One sees, then, the absolutely puny—not to say deceptive—limitations of the best of bench-tests as a guide to aero-motor design, as compared with the impositions of Service. Therefore—since we cannot be pilots and designers, too—that the keenest imagination, the clearest prevision alone can cope with the proposition: and then only if freed from restrictions, brass-bound or otherwise. We have suffered from other failures than the famous R.A.F. From all of which it is only too clear that efficient lubrication, with a fifty per-cent. margin, is the basis of any aero-motor design-scheme.

And if this be true of a four-stroker, to how much greater a degree must it be true for a two-stroke motor giving two-firing-strokes to one, and thus developing twice the amount of B.T.U's. in a given moment. In fact, the most successful two-stroke motor I have ever seen was so far built for its lubrication—if not wholly designed to that end—that its cylinder units were made as big as they would ever have to be—even multiplied up to a dozen—so that any lubrication defect arising from excessive surface-areas should show itself at once and be dealt with.

CERTAIN SPECIAL DETAILS.

Consequently, with a lively imagination of all that Service conditions might come to mean, apart from an appreciation of two-stroke requirements generally, I determined to embody in the "Sans" design, not only the simplest and most positive oil-delivery, but one that, if possible, could not fail mechanically. Needless to say, one could hardly be so minded without being convinced of the fundamental merits of the dry-sump system, even before it had received its present august approval.

The general scheme of the system, therefore, had to be centrifugal. Thus, conventionally enough, the crank-shaft was made the main conduit outwards: and crank-pins and journals at least bored out sufficiently hollow to form "oil-bags." Here the great object is to avoid excess. One must allow centrifugal action to do its share of delivery, or that excess will certainly follow, and there is no use in wasting oil. Consequently, both to the crank-pins and journals, through the webs, and, from them, through the connecting-rods to the gudgeon-pins, the oil leads were drilled comparatively small: the leads through the rods being merely half as large again as the others, to allow for and ease the oil-friction.

On the one hand, and contrary to the usual practice—as will be seen from the illustration on page 1324—it seemed essential to make the hollowing of the gudgeon-pins as large as possible—and not only for the sake of lightness and easy securing, a merely incidental result—to enable them to act as final distributing bags for all the piston and cylinder surfaces. That nevertheless, in measure: for the pistons being differential and thus pressure-ringed below, much less oil than usual could drip into the crank-chamber; and any excess delivered beyond absolute cylinder requirements would accumulate and clog the bottom end. Furthermore, the gudgeon pins had to be hollowed only over the connecting rod head and on the induction side, as it was useless to spurt oil into the exhaust belt. For the rest, how precisely the upper part of the piston and the cylinder walls were to be lubricated importeth not. Suffice it only that there is no outside piping, and no internal conduit other than the reciprocating parts.

MORE PROOF!

The pilot states that the *Triplex Glass* in his goggles undoubtedly saved his eyes from serious injury, and he mentions that while its immediate surroundings were battered the Triplex Glass in the windscreen was undamaged.—*Vide Press.*

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THE DELIVERY MECHANISM.

Excess being thus prevented, the only remaining factor was the mechanism of delivery. To balance the piston throw—and with this purpose in mind—the crank-webs were formed as discs, half an inch eccentric to the shaft centres. One of these webs, however, is slotted segmentally, and internally slotted—as it were with a quadrant-shaped cavity—and fitted with a covering-strap as shown. On the lower half of this strap a hollow plunger is formed, with a helical rib to rotate a cut-off sleeve-valve mounted in a rocking pump-shell anchored in the oil sump by a stud.

AND HOW IT WORKS.

The action of this plunger, of course, drives the oil up into the hollow segment of the web, which, as it rotates, naturally co-acts with the strap as a cut-off valve, and so alternately fills with oil and delivers it forward through the crank-shaft and onwards. If this pump device has any merit beyond cheapness and simplicity, it is that it leaks at the strap! If it did not, it might well wreck the motor with the excess oil pressure. As it is, any excess bypasses out into the sump the shortest way. Nevertheless, the defect, as in all reciprocating pumps, is the slight period of negative action. A later design, therefore, combines the web-segment part of the action with a rotary eccentric disc, blade-piston type positively driven.

Frankly, my only concern as to this design is not to find anything simpler—which seems, on the face of it, hardly possible—or apparently cheaper, but to see it justify its appearance by results if it can. I have no particular pride in it, merely a little curiosity: regarding it as probably as good as, if not better than, others; and as a closely-detailed, yet commercial, attempt to baffle the treacheries of the two-stroke cycle rather than anything else.

(To be continued.)

THE PATENTS INDEX.

The subjoined index of recent inventions has been specially compiled by THE AEROPLANE from the current Official Patents Records.

PATENT APPLICATIONS.

- Antoine, T. Supporting, bracing, and controlling planes of aircraft. No. 7044. May 16th.
 Baldwin, C. Parachutes. No. 7142. May 15th.
 Baxter, C. Propellers for aerial and marine vessels. No. 7178. May 18th.
 Blériot, L. Joints for aerial machines, etc. No. 7268. May 19th.
 Bull, C. W. Control wheels of motor cars and aeroplanes. No. 7149. May 18th.
 Cairns, A. Air brakes for aerial machines. No. 7154. May 18th.
 Caproni, G. Multiplane aeroplanes. No. 7035. May 16th.
 FitzGerald, R. R. Aerial machines. No. 7158. May 18th.
 Shaw, H. Aeroplanes. No. 7244. May 19th.
 Spad Soc. Anon. pour l'Aviation et ses Dérivés. Control of aerial machines. No. 7216. May 18th.
 Tarrant, W. G. Airships. No. 6964. May 15th.
 Tarrant, W. G. Girders, beams, struts, etc., for aircraft, etc. No. 7124. May 17th.

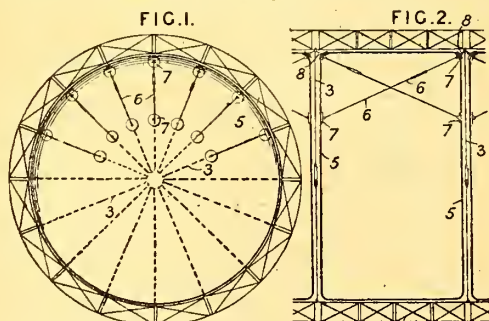
COMPLETE SPECIFICATIONS ACCEPTED, PRINTED COPIES OF WHICH ARE OBTAINABLE ON AND AFTER JUNE 7TH, 1917.

- 16,788 of 1915, dated June 29th, 1916. La Roche. Aeroplanes, hydroplanes, and the like.
 106,113. Nov. 13th, 1916. Turner, J. and I. Textile fabrics used in aircraft.
 106,116. April 20th, 1916. Martinsyde, Ltd., and others. Aeroplane controls.

RECENT ABRIDGMENTS OF PUBLISHED SPECIFICATIONS.

- 104,859. Airships. SHORT, H. O.; Prince of Wales' Mansions, Queen's Road, Battersea Park, London. April 3rd, 1916, No. 1699/17. [Class 4.]

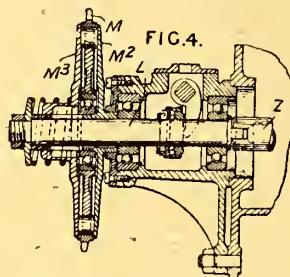
Aerostats.—In rigid airships of the type having a number of gas-containers arranged between transverse partitions composed



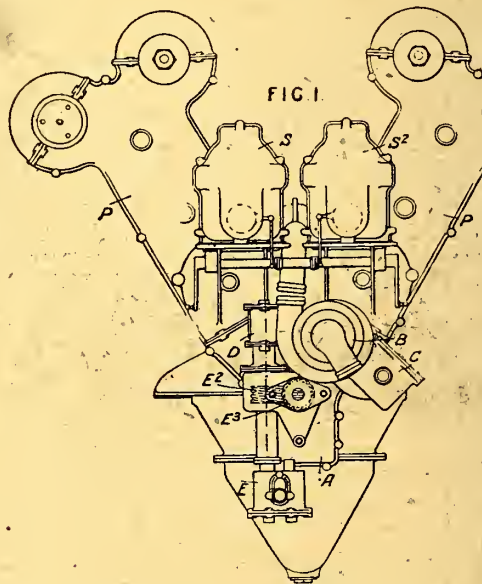
of radial stay wires, the upper parts of the walls of the gas-containers are connected by flexible connections to the main framework in order to relieve the transverse partitions of the lateral pressures exerted by the gas-containers when, for example, the airship is inclined to the horizontal. Figs. 1 and 2 show gas-containers 5 arranged between partition wires 3 and provided with cross-wires 6 connected at 7 to the walls and upper corners of the gas-containers, these upper corners being further connected to the main framework by wires, etc., 8. Sets of cross-wires 6 are arranged in various radial planes as shown in Fig. 1.

104,894. Internal-combustion engines. SUNBEAM MOTOR CAR Co. and COATALEN, L., Moorfield Works, Wolverhampton, March 17th, 1916, No. 3961. [Classes 7 (ii), 7 (iv), and 35.]

Crank chambers; casings; cylinders; cooling; dynamos; arrangement of.—To facilitate inspection and repair of aviation engines having inclined cylinders, the accessories are mounted at one end of the engine upon removable cover-plates. In the arrangement shown in Fig. 1 a water-circulating pump B, a pair of oil pumps D, E, an oil filter C, and a driving shaft L, Fig. 4, for a wireless telegraphy dynamo, are mounted upon the cover-plate A of the crank casing, and a pair of magnetos, S, S², upon the cover-plates P of casings enclosing the driving mechanism for overhead



cam shafts. The water-circulating pump and the shaft L of the wireless telegraphy apparatus are connected to their actuating shafts by sliding connections, preferably of the dog-clutch type, as shown in Fig. 4. The oil pumps are driven from the crank-shaft through skew gearing E², E³. The sprocket wheel M, Fig. 4, for actuating the dynamo of the wireless telegraphy apparatus is combined with a friction clutch M², M³. A revolution counter or an air pump may be carried by the cover of the crank chamber.



104,907. Search-lights, etc. LYON, A. A., Caxton House, Westminster, March 20th, 1916, No. 4743. [Classes 39 (i), 75 (ii), 75 (iii), and 75 (iv).]

Search-lights or like lamps for use on aircraft, etc., are pivotally mounted in gimbal rings or their equivalent, and are mechanically operated from a distance, such as by Bowden control and spring return mechanism, or by two Bowden wires wound in opposite directions, or by a continuous cable or chain. The focussing of the arc lamp and the feeding of the carbons may be similarly controlled from a distance, and ventilating devices may be arranged at the back of, or through, the reflector of the lantern. Fig. 2 shows a search-light with a spherical casing 1 mounted on vertical trunnions in a gimbal ring 3, Fig. 3. The fork or support for the ring 3 is preferably arranged horizontally. Tilting is effected by a Bowden wire attached to a drum 6 on one trunnion of the ring 3, and by a coiled spring attached to the other trunnion, and rotation about the vertical trunnions may be similarly effected, both Bowden wires being attached to a universal lever 23, or to separate screws operated by hand-wheels, or to levers with friction locking-devices. The carbon-holders are carried by sliding racks connected by a pinion and operated from a lever 14 through a

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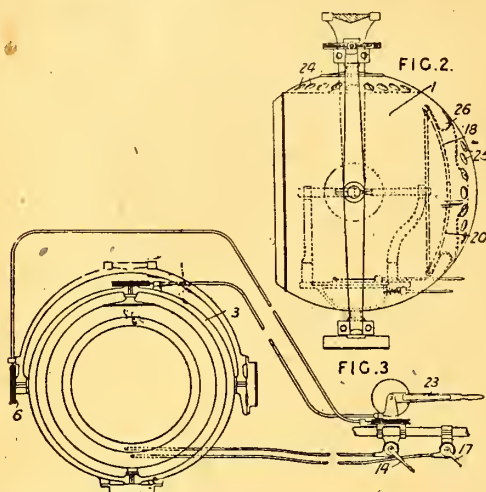
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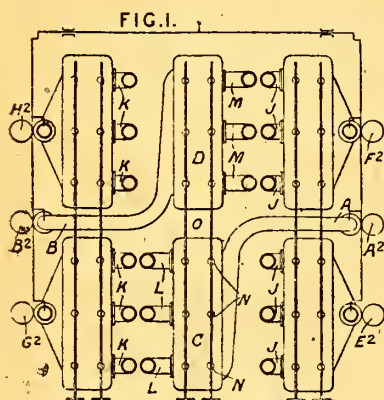
Bowden wire fitted with a spring, and the lamp base may be slid for focussing purposes by means of Bowden or like mechanism from a lever 17. The search-light may be provided with a dioptric lens with or without a hemispherical metallic reflector. When using a parabolic silvered-glass mirror 18, Fig. 2, a cowl



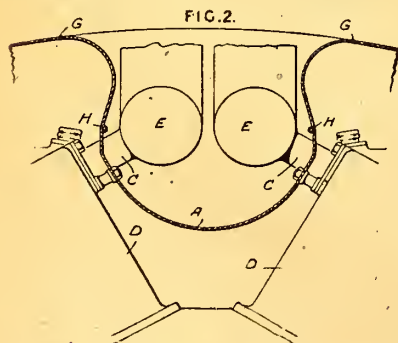
or baffled ventilating holes 25 are arranged at the back of the search-light behind the mirror, which is held away from the back of the lamp casing by clips 26. The air inlets 24 are also baffled to prevent escape of extraneous light. The mirror may have a central hole 20 lined with metal and packed with asbestos to facilitate ventilation when the search-light is pointing downwards.

104,895. Internal-combustion engines. SUNBEAM MOTOR CAR CO. and COATALEN, L., Moorfield Works, Wolverhampton. March 17th, 1916, No. 3962. [Classes 7 (ii), 7 (iii), and 7 (vi).]

Compression engines; cylinders, pipes for; valve-gear; spray carburettors.—Engines having cylinders arranged in two or more



rows, with a separate carburettor for each block, have the carburettors for the central blocks located on opposite sides of the engine and in line with the carburettors of the outer blocks. In a V-type engine having two blocks of cylinders in each of three rows, the carburettors A², B² of the central blocks C, D are arranged on opposite sides of the engine and between the carburettors E², F², and G², H² of the outer blocks. The exhaust pipes K, L, M, J, which pass vertically upwards, are located out of the neighbourhood of the carburettors. The inlet pipes A, B to the central blocks pass between the outer blocks and near to the exhaust pipes. The inlet pipes to the outer blocks may have heating-jackets. Cam-shafts N, O are arranged above the cylinders, each shaft actuating the inlet valves of one block and the exhaust valves of another block.

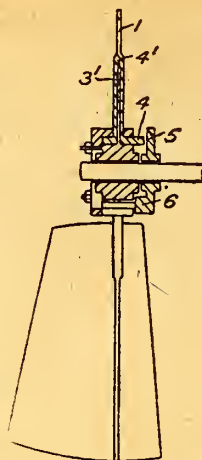


attached to cylinders D. The exhaust pipes C discharge into chambers E.

104,897. Internal-combustion engines; aeroplanes. SUNBEAM MOTOR CAR CO. and COATALEN, L., Moorfield Works, Wolverhampton. March 17th, 1916, No. 3964. [Classes 4 and 7 (ii).]

In engines for aeroplanes, the exhaust pipes are arranged outside the cowl of the fuselage. The cowl terminates at G or H, and is secured to a shield A at

FIG. 2.

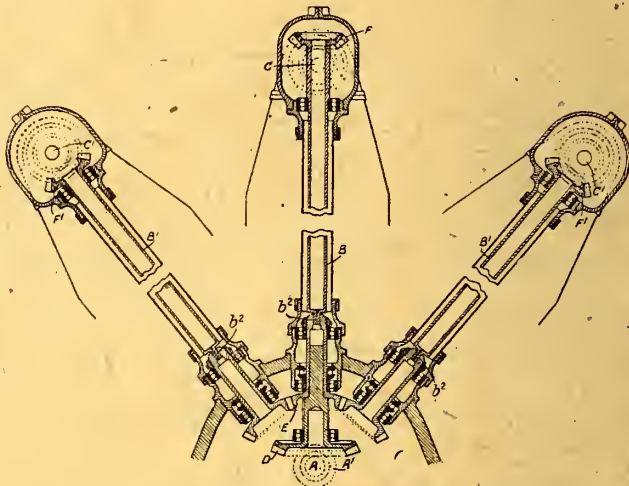


104,932. Aerial propellers. BROCKELBANK, C. H., "Harbour Bar," Old Fort Road, Shoreham-by-Sea, Sussex, March 27th, 1916, No. 4504. [Classes 4 and 114.]

Each blade 1 of an aerial propeller is feathered about an axis which is not coincident with the centre of the blade, so that the blade is returned automatically to the non-operative position by other than mechanical means. The shank 4¹ of the blade is mounted on a rod 3¹ placed radially to the hub. This shank carries a cam 4 which is operated by an extension 6 on the control 5, which can be moved as desired by a lever, screw gear, etc.

104,968. Internal-combustion engines. WOLSELEY MOTORS, LTD., and PITT, J. D., Adderley Park, Birmingham. May 25th, 1916, No. 7401. [Class 7 (vi).]

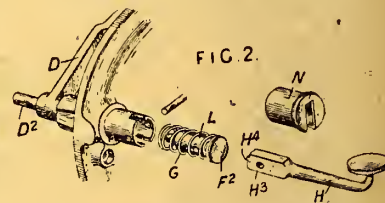
Valve-gear.—In an internal-combustion engine for aircraft, etc., having three rows of radial cylinders with overhead cam shafts, the cam shafts are driven by bevel gearing from the crankshaft A by means of three intermediate shafts B, B¹, one of which drives the other two. The shaft B carries a bevel wheel E, which engages similar wheels on the shafts B¹. The gearing A¹, D from the crankshaft A provides the necessary speed reduction. In order that the cam shafts C, C¹ shall rotate in the same direction, one of the bevel wheels F is inverted with respect to the others F¹. The shafts B, B¹ are formed in two parts with sliding couplings b² to allow for expansion and adjustment.



104,974. Internal-combustion engines. JOHNSON, T., 129, Humber Avenue, Coventry. June 2nd, 1916, No. 7826. [Class 7 (v).]

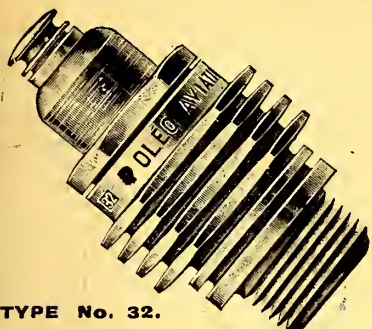
Starting.—A device for relieving compression in an internal-combustion engine cylinder, by opening the exhaust valve by

means of an additional cam, which is operated by a lever which can stand in two positions only, and engages a spring-pressed end of the rocking-lever stem. The exhaust-valve lever D, which is moved sideways for engagement by either one or two cams, is mounted on an axially movable stem D² operated by a lever H formed with flat surfaces H³, H⁴, to engage a head F² fixed to the stem D². A spring G pressing the head F² against the lever H is enclosed by a cover N. To prevent damage by pressing the side of the lever against the additional cam, the head F² can yield against a spring enclosed in a tube L.



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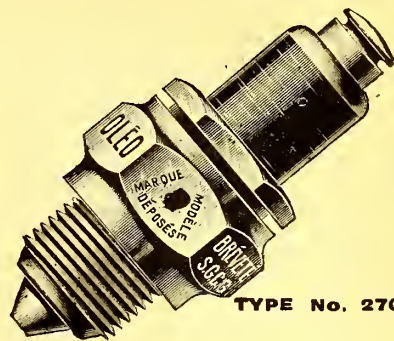
The West India Committee have forwarded to the Overseas Club £819.4s., collected by Mrs. Perez, of Trinidad, to complete the payment for a second aeroplane presented by Trinidad to the R.F.C. The Combined Court having also voted money for the purchase of a second aeroplane for British Guiana, the strength of the British West Indian aeroplane flotilla is now raised to nine.



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MARKET REPORTS.

Prices given are for quantities on the usual terms.

COPPER.—The market remains unchanged, and there is very little possibility of prices advancing at present. Regular supplies are being received, and there is every hope that they will continue.

Current Prices.

Copper Ingot (Standard)	May 25th.
Copper Sheet	£130 cash.
Copper Tube	£165 per ton.
Brass Sheet, 24 gauge... ..	20½d. per lb.
Brass Tube, s.g.	16½d. per lb.
	17d. per lb.

TIN.—The Tin market is very erratic. A week ago the price was over £252, during the week it reached £256, and has now declined to £251 10s.

The position is very indefinite and further prospects are doubtful, although there is a very slight indication of a further decline.

Comparative Prices.

To-day	£251 10s.
Last week	£252 15s.
May, 1916	£196
Average, 1916	£182

LEAD.—Supplies are the chief concern at present. The Spanish situation does not improve, and there is little prospect of immediate deliveries. Official prices still remain the same.

Comparative Prices.

To-day	£30
Last month	£30
May, 1916	£31 10s.
Average prices, 1916	£36 10s.

STEEL.—There are varied opinions on the output of steel. Some consider that in six months' time there will be ample supplies for all consumers, others consider that our present supplies are now quite adequate for all demands.

The last statement should hardly be relied upon; it is certain that the supply of aircraft steels is far from adequate, although there is a general feeling that this position will very soon be remedied. There appears to be a unanimous opinion that the war will continue for some time yet, and while prices are not favourable, they can certainly be considered safe.

Current Average Prices.

R.A.F. 1E round, R.A.F. 3A round, R.A.F. 9, sheet steel, same as last week.

ALUMINIUM.—Deliveries still continue very satisfactory and official prices remain the same.

Official Prices.

Ingot	£225
Remelted	£210

TIMBER.—Prices have soared to an outrageous height, and there is very little sign of a decline; in fact, under present conditions, it appears to be an impossibility.

There is plenty of English ash, but the labour difficulty appears to be responsible for the advance in prices, and this will also intensify the shortage of dry wood.

Current Average Prices.

Silver Spruce, 15s. to 16s. per cubic foot.
English Ash, 13s. 6d. to 14s. 6d. c.f.
Walnut, 2s. 5d. to 2s. 7d. s.f.
Mahogany, 2s. 1d. to 2s. 4d. s.f.

Prices are for selection and delivery.

FABRIC.—There is a rumour that spinners are asking the Government to increase their prices to them. Although this

may be granted, it is not expected that the official prices indicated below will be affected.

Current Prices.

17c Cloth, 29d. per yard, 36 in.
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A WARNING TO AIRCRAFT WORKERS.

In connection with the section of the Defence of the Realm Regulations dealing with "interference with military duties and with war supplies" the following addition was published in a recent "Gazette": "42D. If any person commits any act of connection with any war material likely to render such war material wholly or partially ineffective, or to cause danger or increased danger to any person working upon, handling, or using the same, or if any person engaged in the manufacture, treatment, assembling, transport, or storage of war material wilfully, or in contravention of any order or instruction given to him in the course of his employment, omits to do anything to or in connection with any war material the omission whereof is likely to render such war material wholly or partially ineffective, or to cause danger or increased danger to any person working upon, handling, or using the same, he shall be guilty of an offence against these regulations."

TRUING-UP AEROPLANES.

The following query has been received:—

"Re 'Notes on the Truing of Aeroplanes.' there is a point on which I am not quite clear.

"In speaking of the 'gap,' the writer states that this dimension is to be found on the G.A. drawing, and 'a rough-and-ready method of checking this dimension is to cut a rod to size and insert it between the wings, preferably between the spars.'

"Well, supposing the machine to have no stagger, the gap, as shown on the G.A. drawing, will not be the same at different points along the rib, as the under-surface of the top plane does not coincide with the upper-surface on the bottom plane; and the gap shown on drawing from the nose of the top plane to the nose of the bottom will not be the same as the distance between top and bottom spars."

To this "Alpha" replies:—

"He supposes a case in which there is no stagger in the wings of the machine. In such a case the measuring of the gap is simpler than where we have a machine where the wings are staggered. The gap between the main spars in the top and bottom wings of an aeroplane is equal throughout the length of the wing except in cases where, say, the top wing has a negative dihedral and the bottom wing a positive dihedral.

"Such a machine is not met with in general practice, therefore, if, as I have said before, a wooden rod is cut to the exact length of the gap shown on the General Arrangement drawing, and is inserted between the wings near the interplane struts, it will touch both the top and bottom wings at all points along the length of the wing between the two main spars.

"It is immaterial whether or not the upper surface of the bottom plane has the same camber as the bottom surface of the top plane since it is not that which we are dealing with, but with the top and bottom surfaces respectively of the main wing spars. In some machines the gap near the leading edge of the plane is of a different dimension from the gap near the trailing edge. In this case, naturally, two rods will be necessary. This method is, as already stated, only applied where a properly made gap stick cannot be obtained, but since the main object is to get the correct gap it is immaterial how many lengths of rod are cut, as it is very easy to plane up a piece of wood and cut it to the right length, or else cut off a suitable length of cane or bamboo, &c."

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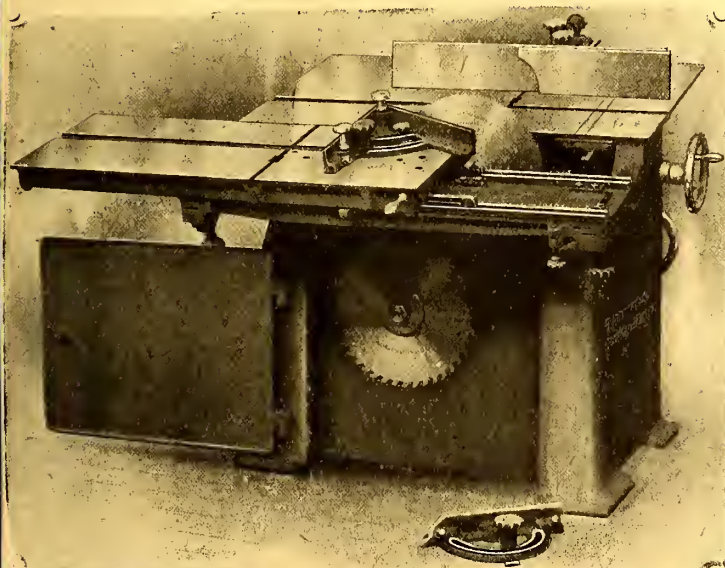
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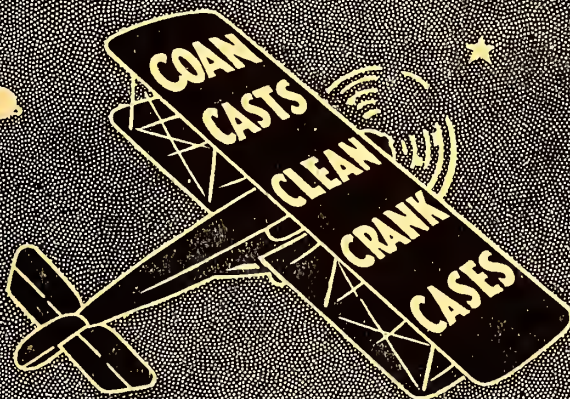
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Integral Propeller Co., Ltd., Hendon

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London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham

Nicholls & Lewis, Ltd., 16, Prince St., B'ham

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Tubbs, Lewis & Co., 29 & 30, Noble St., E.C.2

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Lodge Sparking Plug Co., Ltd., Rugby

Ripault, Leo, & Co. Ltd., (Oleo Plugs), 64a, Poland St., W.

SPRINGS—

Dart Spring Co., West Bromwich

STEEL—

Nicklin, Bernard, & Co., Birmingham

Firth, Thos., & Sons, Sheffield

STEEL FURNITURE—

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James North Hardy & Son, Ltd., 54, Portland St., Manchester.

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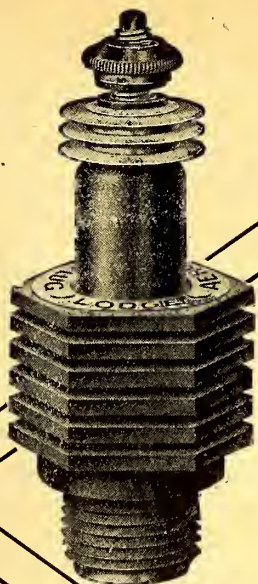
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(Continued from page 1372.)

numerous projectiles. In all 13,000 kilogrammes (over 12 tons) of explosives were dropped, causing considerable damage.

May 27th.—On May 26th our pilots brought down four German aeroplanes. On the night of May 26th-27th our bombing groups dropped 3,300 kilogrammes (over three tons) of projectiles on the enemy's military establishments and factories. Several fires, one of them very violent, broke out in the bombarded buildings. The aviation grounds of Colmar and of Sissone (12 miles east of Laon), and the German organisations in the region of Laon also received numerous bombs.

May 27th.—ARMY OF THE ORIENT.—British aviators successfully bombarded the centre of Livunovo (in Bulgaria nine miles north of Petric).

May 28th.—The air activity was very considerable on May 27th and on the night of May 27th-28th. Enemy machines dropped some bombs in the region of Baccarat (south-east of Nancy), Nancy, and Pont St. Vincent (south-west of Nancy), doing unimportant damage.

Our air squadrons carried out numerous flights, during which they dropped nearly 7,000 kilogrammes (nearly seven tons) of bombs on enemy military establishments and railway lines, particularly in Champagne and in the region of Thionville (about 17 miles north of Metz).

Nine enemy aircraft were brought down, and two were obliged to land within our lines. Five others which were heavily struck were forced to land within the enemy's lines.

GERMANY.

OFFICIAL COMMUNIQUÉS.

May 22nd.—FRONT OF THE GERMAN CROWN PRINCE.—One of our raiding squadrons set on fire five enemy captive balloons in a simultaneous attack at Bouvancourt (north-west of Reims).

May 24th.—Yesterday 10 enemy aeroplanes and one captive balloon were brought down. Lt. Schaefer shot down his 28th and 29th opponents. Lt. Voss reached the same number of air victories by bringing down a machine.

During the 21st and 22nd the English and French lost five aeroplanes in aerial battles and through anti-aircraft guns.

May 25th.—Yesterday the enemy lost 10 aeroplanes, which were brought down in aerial battles and by the fire of our anti-aircraft guns.

One of our naval air squadrons, under the command of Korvetten Kapitän Strasser, on the night of May 23rd-24th successfully attacked the fortified places of Southern England—London, Sheerness, Harwich, and Norwich.

In spite of the improved enemy defence measures, all our airships returned without loss or damage.

May 26th.—Yesterday the enemy lost 20 aeroplanes in numerous aerial engagements, and one other machine was brought down by our anti-aircraft guns. Lieut. Allmenröder brought down his 19th and 20th opponents.

During the course of a successful raid one of our air squadrons dropped bombs on Dover and Folkestone, on the south coast of England. Long-distance flights inland also gave good results.

May 27th.—On May 26th 15 enemy aviators were shot down. Lieut. Voss has gained his 30th victory over opponents in aerial encounters.

May 28th.—Our aviators shot down 12 aeroplanes and two captive balloons.

* * *

It was reported from Lausanne on May 24th, that all British and French flying officer prisoners in Germany are now being transferred from the various prisoners' camps to Karlsruhe and Freiburg, where their presence is regarded by the Government as an effective obstacle to further Allied air raids.

* * *

A report from Karlsruhe states that acting in harmony with the local burgomaster the military authorities have distributed the officers among the principal hotels there, while in order to protect the poorer quarters of the city several schools have been transformed into lodging-houses for the officers.

RUSSIA.

OFFICIAL COMMUNIQUÉ.

May 25th.—An enemy aviator has dropped bombs on Chlok, to the west of Riga. On May 10th, to the south-east of Halicz, an encounter took place between an enemy Albatros machine and the Russian Captain Modrah. The enemy machine fell behind the German lines, and was destroyed by our artillery. The pilot was wounded, and, as observed by our infantry, was carried away.

* * *

On May 23rd Russian seaplanes carried out a highly effective raid on Constanza, dropping some scores of bombs on the harbour quarter, and demolishing warehouses, railway goods depots, and other buildings. Some ships in harbour were sunk, and several explosions and fires caused. The raiding machines returned without damage, in spite of heavy fire.

* * *

On May 24th a Russian air squadron, escorted by a number of swift fighting machines, raided Braila, where about a hundred heavy bombs were dropped. Three depots were destroyed, two reservoirs of naphtha set on fire, and fires caused on two laden sailing vessels. A flotilla of eight enemy monitors, stationed

in the harbour, opened hurricane fire on the aeroplanes with all its light guns, but the machines all returned in perfect condition.

AUSTRIA.

OFFICIAL COMMUNIQUÉ.

May 27th.—The operations yesterday lay entirely on the south wing of the Isonzo army. Army and naval aviators not only supplied valuable reconnoitring results of the enemy's positions, but they devotedly support the artillery and infantry in all phases of the fight.

ITALY.

OFFICIAL COMMUNIQUÉS.

May 22nd.—During the night of the 21st one of our airships bombed the enemy's rear lines near Vogrisca (Vogersko, four miles south-east of Gorizia), in the Frigido (Vippacco) Valley, and returned safely to its base.

May 24th.—Our air squadrons—130 machines—including a group of Navy seaplanes, took part in the battle and dropped 10 tons of bombs on the enemy's lines and brought their machine-guns to bear on masses of the enemy. Our aviators all returned safely. [See Semi-Official Note of same date.—Ed.]

May 25th.—Aircraft were very active. Squadrons of our machines bombed the station of Santa Lucia of Tolmino with visibly effective results. Three enemy machines were brought down by our aviators.

May 26th.—Our aviators flew in great number over the enemy's back lines yesterday, bombed railway works, ammunition dumps and batteries, and attacked the enemy infantry on the march with machine-guns. All returned safely. One enemy machine was brought down.

May 27th.—Our aircraft continued their successful bombing raids on the enemy's communications. The railway station of S. Lucia of Tolmino was severely damaged. Our machines all returned safely. During air fighting above Britovo one enemy machine was brought down, while another fell in flames near Verboia (two miles south-east of Gorizia).

May 28th.—Enemy aircraft bombed localities on the Lower Isonzo, causing a few casualties. Another raid was made against Chiusaforte (without?) damage.

* * *

SEMI-OFFICIAL, MAY 24th.—At daybreak to-day, with the object of assisting the offensive which is developing on the Carso, British monitors with naval forces and Italian aeroplanes made a prolonged and effective attack with heavy guns in the Gulf of Trieste on the rear of the enemy's lines, especially the great aerial station, depots, and other important military objects near Prosecco.

The enemy's repeated aerial attacks had no other result than the loss of two of his seaplanes, which were brought down by our aviators. Four enemy aviators were rescued by our naval units, in spite of the fire from the enemy's batteries. All the naval and aerial units which took part in this action returned to their bases without having sustained the slightest damage. No enemy flag was seen at sea with the exception of those on the aeroplanes which we brought down.

The part played by the Air Service in the operations on the Carso on May 24th constitutes a record. The Italian air fleet engaged consisted of 140 units, of which 29 were battleplanes, 42 observation machines, 16 hydro-aeroplanes, and 53 chasing-planes. During the attack these machines dropped ten tons of bombs and fired 10,000 machine-gun rounds on enemy trenches, depots, and gun positions. Although for this purpose they flew at a dangerously low altitude, they returned without a single casualty.

* * *

On May 22nd the first trial of the aerial postal service between Turin and Rome was made. An aeroplane left Turin at 11.15 a.m., carrying mail bags weighing 440 lbs, and 200 copies of Turin newspapers, and arrived in Rome at 3.30 p.m. The distance is about 325 miles in a direct line.

* * *

Acting on the suggestion that unnecessary gold ornaments would be of greater utility to the Mint than to their normal possessors, the F.I.A.T. firm made over the famous great gold cup called the "Kaiser's Own Cup," won by one of their cars in the 1912 Taunus Circuit. It having been found to be merely plated, the company has generously made good the large sum at which it was valued at. Sic transit, etc.

* * *

Now that the Allied offensive has also begun on this front, the supply of "semi-officials" has been abundant to a fault. That is to say, that their reduction to conciseness, in view of the paper nuisance, has got beyond my powers. The points that stand out so far are: Firstly, the descents in force on the enemy's infantry, thus harrying him in, if not actually preventing him from reinforcing his first line. Secondly, the employment of offensive tactics against shipping, by the Naval aviation folk. Thirdly, the habit of going for the same objective several times consecutively at intervals of a few hours, e.g., a recent series of aeroplane and airships raids by day and night on Prosecco.

* * *

The decision, somewhat delayed no doubt for excellent reasons, has now been arrived at as to the publishing of the names of our "aces" or top-hole destroyers, so one may mention, with un-



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covered heads, Baracca, Ruffo di Calabria, Olivari, etc., etc. Let us not forget the late Captains Gaspar Bolla and Leo Tappi, names known, too, of lovers of horsemanship.

The mention in a communiqué of a new "very fast" Austrian plane is not, of course, news to everyone.

* * *

While looping for a lawful purpose a few days ago, a pilot (whose name, not being essential, may be withheld) had his safety belt break, but as the loop was so satisfactory he got out of it with a whole skin. I correct myself as to his entire cuticle being unharmed as, I think, his nose was abraded in some part.

* * *

Warning has been given to dwellers in cellars that these places may no longer be considered the safest in the event of air raids. So they are to be left to the black-beetles, and we are to occupy the second floor back, keep windows shut if we detect evil odours, and clasp baby in our arms. One hopes it is not all "gas."—T. S. H.

TURKEY.

OFFICIAL COMMUNIQUÉS.

MAY 25th.—Two of our aviators landed with their machine near Salmore, 90 miles south-west of Gaza, and destroyed the telegraph lines and the British Army's water supply pipes.

MAY 26th.—One of our aeroplanes attacked an enemy aeroplane and brought it down in the sea east of the island of Imbros. An enemy triplane was forced to land 100 yards north of the Gulf of Cephalo.

BULGARIA.

OFFICIAL COMMUNIQUÉS.

MAY 21st.—Between 5 and 9 a.m. 13 enemy warships bombarded Kavala, while, at the same time, 12 enemy aeroplanes dropped bombs on the town. Several houses were destroyed, but no military damage was done. Sub-Lt. Eschwege brought down an enemy aeroplane in the plain.

MAY 26th.—Near Seres our artillery brought down a hostile aeroplane which fell behind the enemy's lines.

SERBIA.

OFFICIAL COMMUNIQUÉS.

MAY 21st.—Our aircraft were very active. About 100 bombs were thrown on enemy camps and depots. Explosions of munitions were observed. In the course of an air fight an enemy aeroplane was forced to land south of Drenovo.

MAY 25th.—Our aviators dropped 40 bombs on Konopista (north-west of Liwnica) and elsewhere along the front.

U.S.A.

A notice issued by the Press Bureau on May 20th states that arrangements have been made for the construction of 3,500 war aeroplanes and for the training of 6,000 aviators this year.

* * *

Sergeant-Pilot Ronald Wood Hoskier, an American pilot, was killed in France on April 23rd in an action against three enemy aeroplanes. He abandoned his studies at Harvard University, U.S.A., to join the other American fliers already at the front. After eight months in the schools, he joined the Lafayette escadrille last December, and rendered valuable services during his five months at the front. His "citation" reads:—"Véritable âme d'élite pour sa bravoure et son esprit de sacrifice, est tombé le 23 avril après une héroïque défense dans un combat contre trois appareils ennemis." His Captain's farewell words at the graveside included the following:—"C'était une nature droite, une âme intelligente, éprise d'idéal et de beauté. . . . Pilote adroit et intrépide, il fit ses premières armes sur la Somme. Il fut vite confirmé, et ses premières batailles furent des succès. Il rapportait de plus des renseignements intéressants, dont le commandement admirait la précision et le bon sens, et qui furent très goûtés pendant la dernière avance. Avant hier il sortait avec son camarade Dressy. Le pilote savait ce que volait le mitrailleur, et le mitrailleur savait que le pilote l'emmènerait droit au combat. . . . Ils se lancèrent, dans la mêlée, les mitrailleuses crépiterent, chantant leur cruelle et rageuse chanson, et, pendant que ses camarades retenaient deux adversaires, on vit la machine d'Hoskier en prise avec trois autres, atteinte dans un de ses cables essentiels, tourbillonner et venir s'abattre dans nos lignes. On releva pieusement les corps du Français et de l'Américain, unis jusqu'à la mort, et mieux que tous les mots du monde, de tels faits symbolisent l'union des deux Grands Pays, liés maintenant jusqu'à la fin victorieuse. . . ."

A CASE FOR INQUIRY.

The fall of an aeroplane onto a crowd of people near Sunderland on May 24th caused five deaths and many injuries. An aviator, after looping the loop and performing evolutions over the town, proceeded to fly to the district of Southwick-on-Wear, where a food campaign meeting was being held. One of the wings of his machine caught in a flagstaff, with the result that the machine crashed down, the fore part into a co-operative store window and the tail upon the crowd. A woman and boy were killed outright. Twelve people were injured, and three died later. The machine was completely destroyed, but the aviator was able to walk away without assistance.

AIRCRAFT IN THE HOUSE.

ORAL ANSWERS.

On May 22nd Mr. Billing asked whether an Army Order or any other Order has been issued by the authorities at home or abroad forbidding officers or men of the Royal Flying Corps, or any other portion of the Army to criticise or comment upon the B.E.8 biplane; if so, whether this Order refers to the B.E.8's in use at home as well as abroad; whether this Order has been issued because the inherent defects of this type of aeroplane make it particularly liable to criticism; whether a Brigade Order has been issued to any brigade of the Royal Flying Corps in France forbidding officers to criticise the aeroplanes on which they are mounted; and whether, in such an Order, officers have been warned that their remarks may be distorted by critics of the Royal Flying Corps through ignorance or malice?

[The reference to the B.E.8—now happily an extinct type—was, it seems, an error for R.E.8, on the part of a House of Commons clerk.—Ed.]

The Parliamentary Secretary to the Air Board (Major Baird): No Order has been given at home or abroad forbidding officers and men of the Royal Flying Corps or any other portion of the Army to criticise or comment upon aeroplanes. Criticism and gossip about new types of aeroplanes of which the critics have no real experience is discouraged. This policy has been justified in the case of the R.E.8, which was criticised on its introduction, but is now in much request by Artillery squadrons.

Mr. Billing: With reference to the R.E.8, is the hon. gentleman aware of the reply he gave recently that certain pilots in the Royal Flying Corps refused to fly this type of machine, and that the number is increasing; I understand that Captain Ball refused to fly this type of machine; and, under these circumstances, will he consider the advisability of having an inquiry into the R.E.8?

Major Baird: No, Sir; there is absolutely no need for an inquiry. The R.E.8 machine is being supplied, and directly officers get it they are delighted with it, and we are sending out this machine as fast as we can.

Mr. Billing: Is any action taken against those pilots who refuse to fly?

Mr. Billing asked whether a civilian aviator, Mr. Rowland Ding, recently killed in Yorkshire by the breaking of his machine in the air, was flying a B.E. biplane or an aeroplane of Government design; (2) if it was a B.E. biplane or other machine of Government design, whether it was fitted with an engine of a higher power than the machine was originally designed to carry; (3) whether the B.E. biplane was originally designed for a 100 horse-power engine; (4) whether it was first sent on active service with only a 70 horse-power engine; (5) whether it is still sent on active service with only a 90 horse-power engine; (6) whether it has been found to be safe to fly with an engine of 150 horse-power; (7) whether such power is being fitted to this type in order to attain a reputation for Government official design; (8) and whether, in view of the recent fatality occasioned by this, he will now cause this practice to be discontinued?

Major Baird: The aviator referred to was in the private employment of a firm of aeroplane constructors, but I understand that he was flying a B.E.2 machine with a 90 horse-power R.A.F. engine, which is the type for which it was originally designed. The answer to the fourth, fifth, and sixth parts of the question is in the affirmative, and to the seventh part in the negative. The last part of the question, therefore, does not arise.

ENEMY OUTRAGES (REPRISALS).

On May 23rd Mr. Billing asked the Prime Minister whether he will state the reasons for the reluctance shown by the authorities to initiate air raids as a reprisal for the sinking of hospital ships and other enemy outrages?

Mr. Bonar Law: I have no statement to make on the subject.

Mr. Billing: Have we not put ourselves in a humiliating position by adopting a great principle and then on a question of expediency—

The Speaker: That seems to be a matter for argument.

CIVIL AERIAL TRANSPORT COMMITTEE.

Mr. Billing asked the Prime Minister when it is proposed that the new Committee for considering the development of our air policy after the war shall have its first sitting; and whether its proceedings will be secret, or if it is proposed to lay any of its recommendations upon the Table?

The Parliamentary Secretary to the Air Board (Major Baird): The proceedings of the Civil Aerial Transport Committee which will meet immediately after Whitsuntide, will be, in any case for the present, entirely confidential. Until the nature of the Committee's recommendation is known it is not possible to answer the last part of the hon. Member's question.

WRITTEN ANSWERS.

CIVIL AERIAL TRANSPORT COMMITTEE.

Mr. Butcher asked the Parliamentary Representative of the Air Board whether he will state the names of the members of the Committee appointed to inquire into aerial civil communications after the war?

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Major Baird: The composition of the Civil Aerial Transport Committee will be as follows:—

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Major Baird, M.P., DEPUTY-CHAIRMAN.

The Duke of Atholl.
Colonel Lord Montagu.

Lord Sydenham, G.C.S.I.
Mr. Balfour Browne, K.C.

Mr. A. E. Berriman.
Mr. G. B. Cockburn.

Mr. G. Holt-Thomas.

Mr. Claude Johnson.

Mr. Joynson-Hicks, M.P.

Mr. F. W. Lanchester.

Lieut.-Col. M. O'Gorinan, C.B.

Major-General Ruck, C.B.

Mr. J. S. Siddeley.

Mr. T. Sopwith.

Mr. H. G. Wells.

Mr. H. White-Smith.

Mr. W. Tyson Wilson, M.P.

Sir Laurence Guillemand, K.C.B., representing the Treasury and Board of Customs.

Colonel J. W. Pringle, R.E., representing the Board of Trade.

The Earl of Drogheda, representing the Foreign Office.

Mr. G. E. A. Grindle, C.M.G., representing the Colonial Office.

Mr. G. E. P. Murray, C.B., Secretary of the Post Office, representing the Postmaster-General.

The India Office will be represented by Lord Montagu.

Sir Thomas Mackenzie, High Commissioner for New Zealand.

Right Hon. W. P. Schreiner, High Commissioner for Union of South Africa.

It is hoped that Canada and Australia will also nominate representatives.

Captain Vyvyan has been nominated by the Fifth Sea Lord of the Admiralty to represent the Royal Naval Air Service, and

Brigadier-General Brancker will represent the Royal Flying Corps.

The Meteorological Office have also been asked to name a representative, and one or two additional names will be subsequently announced.

Mr. D. O. Malcolm will be the Secretary of the Committee, whose offices will be at Winchester House, St. James's Square.

THE LAMENT OF THE BROKEN PILOT.

Farewell to the Clerget's steady drone
And the song of the stream line wires.

Farewell to the thrill of Omnipotence
Which flying alone inspires.

'Tis for better and stronger men to fly
Out into the Great Unknown,

Seeking adventures under the sky
Undaunted, and—alone.

As I watch the seaplanes scurry along
In a smother of glistening foam,
I sigh as I think of the "might have been,"
And my thoughts they start to roam;
I follow them out on their long patrol.
By lightship, channel, and shoal,
Watching the ships of England sail
Steadily to their goal.

On a sudden, the air is filled with sound,
And I wake from my dreamy trance,
As a triplane dashes along the coast,
Steering for France—for France!
The land of adventure and knightly deeds,
Where the Pilot faces the foe
In single combat as was of yore—
Giving him blow for blow.

Ah! why am I not amongst the throng
Of chivalry, youth, and pride?
But left on the strand, a broken reed,
As a fish by the ebbing tide?
My comrades have entered the airy lists
In the name of Freedom and Right,
Whilst I must remain for the humbler task
Of keeping their armour bright.

"You are safe," they say, to comfort me,
"Tis foolish to long for the moon.
Why should you wish to risk your life?
Death cometh to all—too soon."
But has ever there been a greater cause
In the history of mankind,
A cause more worthy of sacrifice,
Or a nobler death to find?

But time is dulling the edge of my grief,
And I think the wound is healed,
'Til a little thing comes back to me
From the life that should be sealed;
It may be the smell of the acetone—
Or the whirr of a racing screw—
Or the singing wires of a gliding plane
Which opens my wound anew.

H. R. G. W.

AMERICA.

(FROM THE SUBMARINE POINT OF VIEW.)

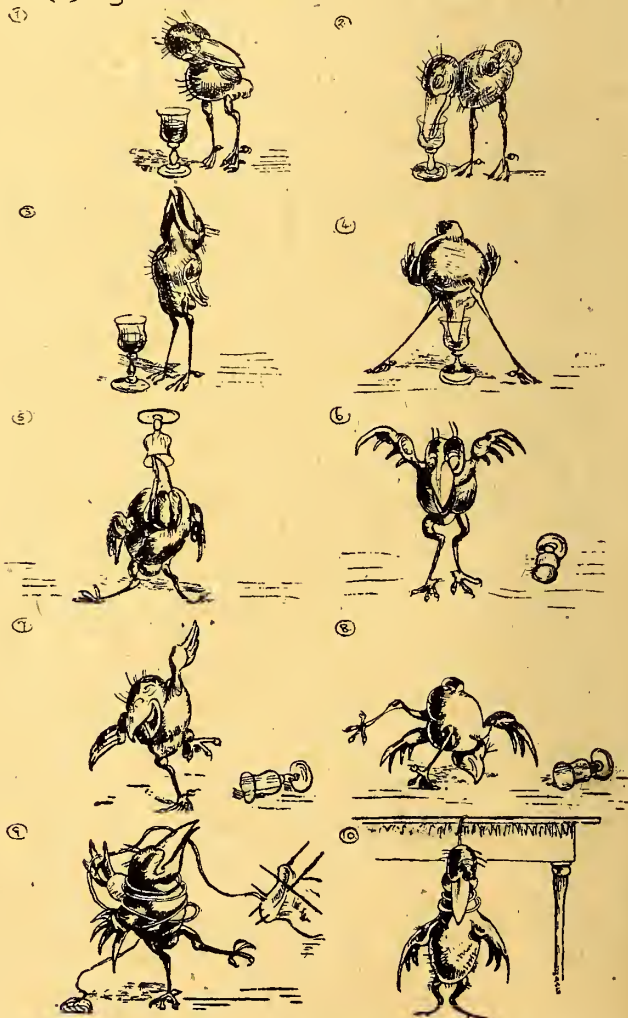
Too proud to fight? I'm not so sure—our skipper now and then
Has lectured to us in the boat on other nations' men
And submarines of long ago, while diving round the Bight,
And I know when once their killick's up those Yankee men can
fight.

Why, if I were in the Army (which I ain't—and no regrets)
An' I had the pick of history, from London's latest pets
To Hannibal and Wellington, to follow whom I chose,
I wouldn't think about it long—I'd give the job to those
Who fought across a continent for three long years and more—
I bet the neutrals didn't say, in eighteen sixty four,
Of Jackson, Sherman, Lee, an' Grant: "The Yanks can only
shout."

Them blokes was somewhere near the front when pluck was
handed out.

But what the skipper said was this: "There's only been but one
Successful submarine attack before this war begun;
An' it wasn't on a liner on the easy German plan,
But on a well-found man-o'-war, an' Dickson was the man
Who taught us how to do attacks—a tip for me and you.
An' I hope we'll keep the standard up that's set by Dickson's crew,
For they didn't have a submarine that cost a hundred thou',
But a leaky little sardine-tin—and stuck upon her bow
Was a spar-torpedo like a mine, an' they an' Dickson knew
That if they sank the enemy they'd sink the 'David' too.
She'd drowned a crew or two before—they dredged her up again,
An' manned and pushed her off to sea—(My oath! it's pretty plain
They had some guts to give away that tried another trip
In a packet that they knew was more a coffin than a ship)—
An' they carried out a good attack, and did it very well,
As a model for the future; why, it beats the books to hell.
A tradition for the U.S.N., and one for England, too,
Because we like to think that they were kin to me and you.
And I'd like to claim an ancestor with Dickson when he died
At the bottom of the river at the 'Housatonic's' side.

A Story without Words, but with a moral



A Warning to Young Aviators.—Reproduced without permission from "The Wing Tip," R.N.A.S.

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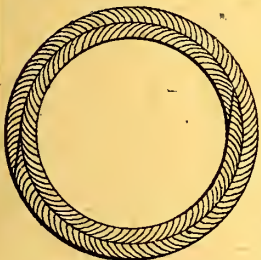
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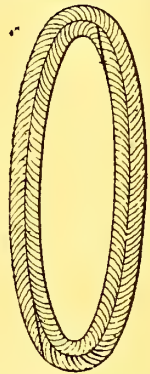
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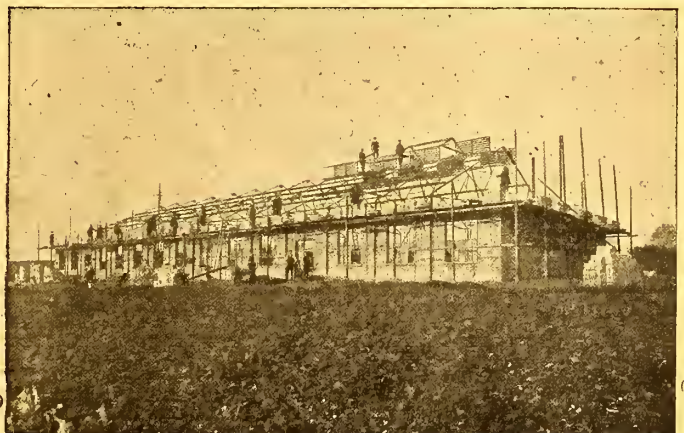
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ACTIVE SERVICE FLYING IN EAST AFRICA.

The Johannesburg "Star" of a December date gives the following interesting account from Reuter's correspondent of the work of the South African aviators in German East Africa:—

The 26th (South African) Squadron of the Royal Flying Corps is a unit which fills me, as a South African, with great pleasure. The squadron which we have with us in East Africa—in spite of many difficulties which I will discuss later on—has "made good" in its exposition of the art and science of aeronautics. Apart from actual flying it is a self-contained unit. It has its own transport, and that transport is mechanical. Its motor cars and trollies are of the latest make, and it carries workshops to keep them in repair. Its camps are lighted with electric light. It fetches its own provisions from the line of communication dumps. It guards its own camps, builds its own blockhouses to protect its own aerodromes, and when it wants to communicate with Headquarters it speaks through the medium of its own wireless installation.

Its personnel is, of course, in the first place South African, but it is also Imperial. Its commanding officer is the son of a missionary, whose name in the native territories is one to conjure with. Its "star" pilot bears the name of one of the oldest of the Dutch families in South Africa. Upon the roll of its dead are two men—"Steenekamp" and "Bertram"—than whose no better names are known from Cape Town to Zambesi.

By a curious coincidence, due to the exigencies of war, the 26th Squadron of the Royal Flying Corps embarked for East Africa upon Christmas Day, after a severe training at home. They reached Mbuyuni, after rounding the Cape, and successfully negotiated the delays of Kilindini, by February 1st, 1916, and discovered there that they had no propellers for their machines.

[Who shot the Equipment Officer, or O.A.D. official? If not, why not?—Ed.]

However, some five spare propellers attached to quite different engines were available, and although a special lathe had to be erected in order to enable those propellers to be fitted to the machines, by February 9th Capt. Creed took up the first aeroplane on a trial run. The Royal Naval Air Service had already flown in East Africa, but I am concerned now at the moment not with the work—good as it was—of that Service, but with the Royal Flying Corps.

At that time the enemy was holding the Salaita salient. General Tighe was taken for an observation trip over their positions before the advance began, and during that strenuous week in March, when the enemy was driven out of British territory, and the Kitevo hills were carried by assault, the aeroplanes watching overhead reported carefully every movement of the enemy's troops, except when, to escape their vigilance, and in fear of their bombs, the enemy evacuations were made under cover of darkness.

From the occupation of Moschi to the enemy's final retreat from Kahe, the aeronauts were busy bombing, observing, and reconnoitring. On the 24th Major Wallace, who had been delayed in South Africa by illness, took command.

On the 28th tragedy waited on the flying men of the Royal Naval Air Service. They had been ordered to make a reconnaissance, and though their sparking plugs were defective, they refused an offer by the R.F.C. to do the work instead. Pilot and observer ascended, and were never seen again. Capt. Creed went out to do the work and look for the naval men, and had to be looked for in turn, but eventually returned in safety.

Hard Work at Handeni.

At the beginning of May the Flying Corps got its wireless into order, and many alterations, representing great ingenuity and adaptability, were made in the machinery. On May 9th, Lieut. Bell, with General Hoskins as an observer, traversed the Pangani River. The month, as a whole, was devoted to hard work—assembling new machines and correcting the errors of the old.

[Why were there errors?—Ed.]

On the 22nd the corps said good-bye to Kahe, and the advance commenced. Next day gallant Steenekamp, testing a new Henri Farman, crashed to earth, and was picked up as much a wreck as his machine. His brother pilots think he fainted in the air. They know of no other way to account for the sudden dip which his machine took.

Capt. O'Brien was missing at the time, and it was with intense relief that he was greeted on his return on foot. [His adventures appeared in THE AEROPLANE some time ago.—Ed.]

Fever now laid its hand upon the Corps, and quinine was scarce. Still the Flying Corps worked and scattered bombs about Handeni, though in June fever began to increase. Capt. Turner's machine was pierced by shrapnel from a German anti-aircraft gun, and Carey-Thomas—well known on the Rand—lost his way and landed upon a disused aerodrome far in the rear.

To add to the other risks run, the squadron endured a good deal of anxiety on account of lions. These well-meaning and really quite harmless, but terrifying, animals had closed in behind the marching brigades, to feed upon the dead and dying animals that fell by the way. These lions were frequently encountered by men passing to and fro on motors, and one or two were bagged.

During the month of July the main body lay at Maiha, under the galling shell fire of the enemy; and it was with sheer delight that they witnessed the air raids upon his camp at Ruhungu. Men who had spent the day in their dug-outs swarmed on to the hill-sides to watch the smashing blows of the great 100-lb. bombs and hear the dull reverberation of the explosions, while the enemy camp became enveloped slowly in great clouds of dust and smoke. In July Turner had a forced landing, the crash rendering him unconscious, but was assisted back to camp by a native—who was afterwards hanged by the Germans, together with three of his companions.

Raids and Rewards.

On July 20th Intelligence received information that a raiding party of the enemy was marching on the aerodrome, and now a new problem presented itself to the Flying Corps. They turned to and entrenched themselves so effectively that the raiding party sheered off. Work at this time was very difficult. There was no opportunity of building an aerodrome close to the fighting line, and the planes had to traverse great distances to get at the enemy. The country, however, between our front and the existing 'dromes was so thick and heavily wooded that it was impossible to get any nearer.

In July the pilot Bell received a Military Cross for the conspicuous courage with which he carried out his raids and scouting in the early days of the advance.

On August 7th the move against Ruhungu commenced, and great and ceaseless vigilance was required from the aviators. Every movement of the enemy had to be watched and reported on, and when the enveloping movement under General Brits lost touch with Headquarters pilot Van der Spuy earned the Military Cross by finding the General's headquarters after a long, arduous, and dangerous flight.

In August Morogoro was visited for the first time by the "birds," and in the face of a storm of shrapnel and some erratic attempts with rockets, the railway station and the enemy's military lines were successfully bombed.

On August 11th one of the most successful of the bombing raids took place, when five aeroplanes attacked the town and fortified camp of Ngulu Kwa Boga. Subsequent reports show that the enemy suffered heavily. Some 200 or 300 were killed or injured, and the damage done by fire to food supplies and clothing was enormous.

Around Morogoro.

During this month one of the motor-cycle dispatch riders was chased by a rhino, and only escaped by abandoning his machine and hiding. The pilot Carey-Thomas and the observer McKeiver in the later part of August had a still more unpleasant experience. They were forced to land well within the enemy's lines, and only regained safety after marching some 40 miles on foot, always in danger of being captured by the enemy, and—as the Askaris "don't 'alf mean to do a thing"—to the flying men if they catch them—the danger was a very real one.

The squadron was now located in Morogoro, and the penultimate phase of the campaign had been brought to a conclusion. Its aircraft park was 350 miles behind it, and its advanced aircraft park 200 miles. Some concentration, therefore, appeared to be necessary, and that is now going on.

Meanwhile the advance from Kissaki was greatly facilitated and assisted by a distribution of free gifts over the fort and camp of Kissaki in the shape of aero bombs; and the planes for the first time reconnoitred the Rufiji River. Here the enemy was discovered crossing the river by means of an elaborate ferry, and both his bridge-heads were attended to with bombs successfully.

This, then, is the story up to to-day of the work of the Flying Corps in East Africa. It is a simple story of steady endeavour. There has been no opportunity for the display of dramatic and brilliant enterprise, nor have hostile aeroplanes been encountered. On the other hand, the danger of flying in East Africa is peculiar to the country, and should not be under-estimated. A forced landing almost invariably means a crash, and the pilot is more than lucky if he escapes with his life. Then, too, the Flying Corps are exposed, as everyone else, to the fever and diseases which abound in the country, and these fevers are particularly dangerous to men to whom clear heads and clean, taut nerves are essential.

The writer of the article concludes by pointing out the necessity for a permanent Aviation Corps in the South Africa defence organisation.

LATER NEWS.

The Johannesburg "Star" of a later date continues the tale as follows:—

Reuter's special correspondent with the East African Expeditionary Force writes:—

Duty took the Officer Commanding the Royal Flying Corps to Kilossa. I now belong to the Royal Flying Corps, and duty took me to Kilossa, too. Duty on this particular occasion appeared in the shape of a very fine Crossley touring car, into which we packed camp beds and kit, a mechanic, a batman—and a chop-box. And while "jocund dawn stood tip-toe upon the misty mountain tops" of Morogoro, we slid out westwards.

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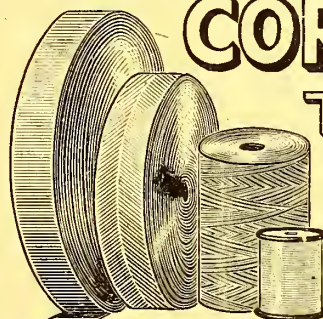
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DELIVERY FROM STOCK.

The road to Kilossa produced nothing extraordinary in the scenic way, but it was a pleasant journey. At about 8 o'clock the shade of a tamarind tree invited us to breakfast, and we eked out our bully beef and biscuit with jam and a pickled walnut—not all together, you will understand—the jam came after the bully beef and the pickled walnut with it. The tea was a little muddy, but for all that our appetites were on edge, and we breakfasted satisfactorily.

Kilossa is the ordinary sort of East African dorp—a long row of native houses, a shady avenue, a loop-holed white house or fort set upon a rise, with bastions and comfortable officers' quarters. Here we lunched with the Divisional General Van Deventer.

From the divisional headquarters we buzzed along through avenues to the outskirts of the town, where the Royal Naval Air Squadron had its headquarters. There upon the side of the hill floated the white ensign—the red cross of St. George—flown only by the Royal Navy. Three hundred miles inland it seemed inappropriate; one associates it with the rule of the sea, not as yet with the mastery of the air.

The Royal Naval Air Service is of the Royal Navy; what more need one say in compliment and praise of it? There is rivalry between the two branches of the flying service—the military and the naval. I don't think that will do any harm. The sailors made us welcome—the navy is nothing if not hospitable. So we erected our camp beds upon the lee side of their house and made ourselves at home.

An interesting character I met there was "Cherry Kearton"—official photographer of the Naval Squadron—whose wonderful photographs of wild animals draw immense crowds at all the kinemas of the world.

[The rest of this article has, curiously enough, no reference to flying.—Ed.]

PORTUGUESE FLYING.

The Portuguese flying service had its earliest roots in 1912, when an agitation in favour of providing the Army with aeroplanes resulted in the subscription by the public of fairly large sums for the purchase of aeroplanes, and a Maurice Farman, a Voisin, and an Avro were actually purchased during that year. Either because the particular political crisis which the agitation for aircraft was intended to conceal was successfully tided over—or for some other reason of State—nothing beyond these purchases and the drawing up of various schemes for a national flying school occurred at that time.

From information contained in "Revista Aeronautica," the

official organ of the Aero Club of Portugal, it appears that early in 1916 the proposed flying school was actually inaugurated.

Apparently the proposals which were drawn up in 1912 by Mr. H. V. Roe on his visit with the Avro biplane, delivered to the Portuguese Government after tests by the late Mr. E. Copland Perry, have been to a large extent followed, and the school has started operations on the site recommended by him.

The position—if this is indeed the case—is very nearly ideal, considering the mountainous nature of the country, providing a very large natural aerodrome—a long frontage onto an excellent stretch of water for seaplane work. In addition, there is direct railway and water communication with Lisbon.

Previous to the inauguration of the school a number of officers were sent to France and England to learn to fly. Of these, Lt. José Barbosa dos Santos Leite, of the Army, and Lt. Artur de Sacadura Freire Cabral, of the Navy, and Senor Antonio Joaquin Caseiro, a non-executive Naval officer, proceeded to Chartres in Nov., 1915. All these obtained their pilot's certificates by March of 1916, and then proceeded to qualify for their military brevet at various French Army schools.

Three Army officers, Senors A. Torres, A. Maia, and A. Portela, qualified for their civil brevets at the Ruffy-Baumann School at Hendon during June and July, 1916, and qualified as military pilots at one of the R.F.C. schools.

It may be presumed that these officers now form the instructional staff at the Portuguese flying school.

As to the actual organisation of the school, very little can be discovered. "Revista Aeronautica" contains pages of regulations for the conduct of the school, but they are all of the nature of "King's Regulations," of very considerable importance actually, but of very little general interest.

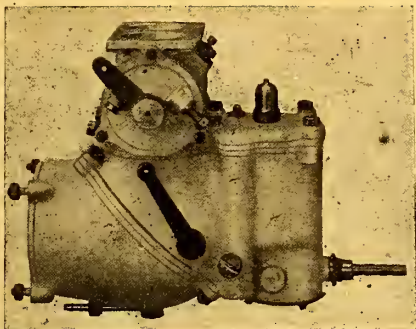
Provision is made in these regulations for training aeroplane pilots, airship pilots, and free balloon pilots, and their appropriate observers, and also for mechanics of all grades.

A commission has been sent to the Higher School of Aeronautics at Lausanne—which may be considered as an aeronautical university—and it may be assumed that this commission has as its object the institution of a fairly thorough course of theoretical training, and it may be fairly safely expected that the technical side of the instruction will be extremely complete.

At the same time, considering the large number of extremely good horsemen to be found among Portuguese officers, it may be expected that at least a fair proportion of excellent pilots should be turned out.



(Reproduced from "Revista Aeronautica.")
Senors A. Torres, A. Maia, and A. Portela, of the Portuguese Flying Corps, photographed at the Ruffy-Baumann School.



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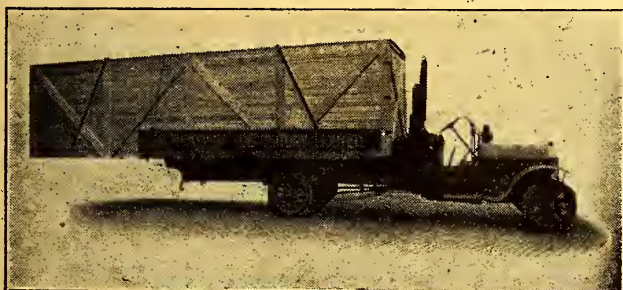
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*In this land of the law-ridden scoffer,
Though all ultimate good be your goal,
If a duplicate warrant you offer,
Or for rubies you substitute coal;
Or on paper the name of a neighbour
You inscribe, having doubts of your own,
It means two of the best, with hard labour—
Or without, if your family's "known."*

*But in Francè, when a patriot "borrows,"
Or otherwise toys with the Fates,
"Sursis" means surcease of his sorrows;
It is French for the cleansing of slates.
Oh! what meed, or what marvel were meeter
Than this boon of the practical Gaul,
Whereby the defrauding of Peter
Is condoned by the payment of Paul?*

G. DE H.-S., May, 1917.

Now, contrary to the usual cinema-drama-disclaimer of any reference to any living person, all this does refer to several distinguished people, with all sympathy for their misfortunes and no little envy of their opportunities. But particularly it refers to our excellent *compère* Armand Deperdussin, and the still more excellent French law of "*sursis*"—a kind of First Offenders Act—which, after three and a half years of wasting his time and talents in Mazas, awaiting his trial, has very properly enlarged him; to serve his country again; and better, if possible.

Such, indeed, are the only conclusions to which any logical person can come who knows the circumstances, or has read the report of that trial with due understanding. Unless there be one other—to which my own variegated acquaintance compels me—that in this country we habitually waste our best criminals and elect only the third and fourth-rate shoplifting, mush-faking kind to the seats of power. Otherwise we should have won the war long ago. Anyway, until things are altered, no child of mine shall ever become a criminal or a journalist.

Even as it is, if I had only had the sense to make a nuptial contract concerning the non-existent—as it seems Armand Deperdussin did with his wife—there are three London banks that I would cheerfully rob of a great deal more money, and promise to spend at least two-thirds of the proceeds on the British aviation industry. For the rest, it would be a pity if Maryland and Australia could not between them furnish the necessary testator to account for the other third. Better that, and the money kept in the country, than that they should be robbed of ten times as much by the discounting of the paper of German banks; as they have been for years. Every time the latter wanted an odd million for a new commercial venture or industry. Behold our clever bankers, to whom we trust our money!

But as to this three-days trial of the other day, literally the finest, most characteristic monument of *La France Humaine* that has ever been raised into imperishable history. Who Armand Deperdussin was, and the more that he became, since anywhere about 1912, we all pretend to know: the first to conceive and realise the ideal of the high-speed war-plane, against all the strongest opposition of the official experts; the man who came in to revive French aviation when it was semi-moribund for lack of money and encouragement; the creator, with the technical assistance of M. Béchereau, of several entirely new models of his own original type; the owner and manager of two great aeroplane-building concerns and of the great aerodrome at Reims, which, as he truly said in his defence, would otherwise have been acquired by Herr de Mumm and converted into a centre of aerial German espionage; and finally President of the Ligue d'Aviation Française and Knight of the Legion of Honour. Many a time has the red ribbon been less deservedly won and worn. For by these things did Armand Deperdussin do much to save France in her utmost need.

DEP'S HISTORY.

So much for what you and I and the youngest reporter in Paris know he did, while others talked and wrote and flouted his best ideas as those of an impractical dreamer. This, then, for the more human story of who he had been, and how he contrived it all, from the hinder end of nothing but an idea and his own persuasive personality.

Until 1901, when he came to Paris from Belgium, Armand Deperdussin was nothing more than a traveller for a small silk-dealing firm in the Rue des Jeuneurs. But he had the great single idea of creating a gigantic "silk trust," since no such concern existed.

Incidentally, he had taken the trouble to learn all there was to learn about the silk business, and so when he got into touch with money in the shape of the Comptoir Industriel et Colonial, he

could talk real business to its managers. And these, being business men as much as bankers, could appreciate the possibilities of profit he set forth in such detail. So they simply gave him the credits he needed, on condition of handling his paper—at a percentage. Which is banking of a kind not understood in London east of Charing Cross.

BIG MONEY.

So for the next ten years—from 1903 to 1913—Armand Deperdussin managed to handle a turnover in silk of no less than eight millions sterling. Possibly, he got confused with the amount of it. Anyway, he lost the Comptoir something over a million of it.

He was accused of misdiverting to himself some £640,000: which, after all, was scarcely a ten per cent. commission turn on those eight millions. How much profit the Comptoir made has not, so far, been admitted. Nor has anyone noticed that it took them just ten years to find out the alleged defalcations in their own business!

Fortunately, however, for France and Madame Deperdussin—who had been an assistant at a silk-shop—he had effected the usual independent-property arrangement of prudent Frenchmen, and so was able to pass the whole of his profits on to her.

Thus the story; and now to let the evidence tell its own eloquent tale.

THE JUDGE.—It seems that you spent about £120,000 on aviation?

THE PRISONER.—I spent more than double: more than £250,000.

THE JUDGE.—Yes. But this money, fraudulently obtained, was the cause of your being honoured.

THE PRISONER.—That is partly true. But I seemed to live in a mirage: ending by believing it was all quite natural. If I spent so much on aviation, it was because of my popularity. I could not stop. I became *une poire*. . . . I was obliged to go on: there seemed to be no escape. . . . But my wife was quite innocent. She was my first and greatest victim.

THE WITNESSES FOR THE DEFENCE.

Then into the witness-box trooped a string of the best known French military pilots—among them the Adjutant Jules Védrières and the Lieutenant Gilbert—as well as numerous French officials. Said Védrières: "Deperdussin . . . rendered an immense service to the French nation; wholly incalculable. It was he who had the first notion of rapid flying; strongly opposed and flouted at the time by all the official experts."

Said further Lieut. Gilbert: "Deperdussin by his generosity and the real knowledge he showed, paved the way for our present

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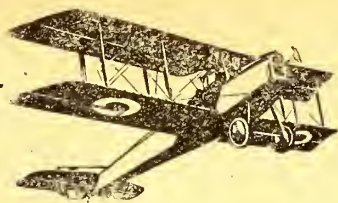
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superiority in the air. . . . I have only one regret that he was not set at liberty at the outbreak of the war."

One after another the famous Dep. pilots were called. After the calling of certain names, Emile Védérines, Brindejonc des Moulinais, in a hushed court came the answer, "*Mort sur le champ d'honneur.*" And every living pilot swore to the good work Deperdussin had done.

Then after most of the second day had been occupied in hearing the Comptoir's counsel, Maître Salle, bewailing its "heavy losses," Georges Prade, the most flamboyant of French motor journalists, went into the box to the following effect. "Deperdussin arrived when, for lack of funds, French aviation was at a standstill. All our best specialists had gone to Germany at big salaries. Then Deperdussin . . . began to spend large sums without stint. He raised the declining industry, he caused the closed aeroplane factories in France to be re-opened, he engaged one of the best engineers, M. Béchereau, and opened up a new vista.

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WAR PROOFS.

*Then it was shown that since the war the French Government had given orders for Deperdussin aeroplanes to the value of £2,800,000, and that had Deperdussin remained in the Spad Avion Company his share would have come to £560,000. But, continued the evidence, he being now technically insolvent, the bank had no chance to recover, and were therefore fain to claim one franc as nominal damages.

Lastly, on the third day, the jury retired with nearly 2,000 printed questions to consider. But in ten minutes the foreman came back, asked to see the judge, and said, "The jury have unanimously decided to ask the Court to give the prisoner Deperdussin the benefit of the law of *Sursis*, or indefinite postponement." Which—after they had otherwise found him guilty and Madame innocent—was accordingly done. Armand Deperdussin was sentenced to five years, and immediately released, after the Judge had told him that "the heroes of France had come to shelter him with their wings"—meaning Védérines, Gilbert, and Co.

The Comptoir Industriel et Colonial, of course, got its franc. So careful and patriotic an institution will know where to put it safely.

G. DE H.-S.

THE "TRUMPS."

"La Guerre Aérienne" publishes the following lists of French and German champions.

The prefatory remarks are not without their humour, and translate as follows:—

"The 'trumps' literally aces (*les as*), are the order of the day. The French continue to augment their *palmes*, the English attain some prowess, and have some losses, the Germans continue to people their cemetery of champions."

FRENCH SUCCESSES.

Capt. Guynemer, 36 machines; Sous Lt. Nungesser, 21; Capt. Heurtaux, 20; Sous Lt. Dornie, 18; Lt. Deullin, 13; Sous Lt. Navarre, 12; Adjt. Chainat, 9; Sous Lt. Chaput, 8; Sous Lt. Tarascon, 8; Sous Lt. Viallet, 8; Lt. de la Tour, 8; Lt. Pinsard, 8; Adjt. Madon, 8; Adjt. Ortoli, 8; Capt. Doumer, 7; Adjt. Casale, 7; Maréchal des logis Flachaïre, 6; Adjt. Lufbury (Américain), 6; Adjt. Sayarat, 6; Adjt. Jailler, 6; Adjt. Douchy, 6; Sous Lt. Loste, 6; Adjt. Vitalis (mitrailleur), 6; Adjt. de Bonnefoy, 5; Adjt. Bloch, 5; Lt. Gastin, 5; Capt. Matton, 5; Sous Lt. Regnier, 5; Sous Lt. Borzecky (observateur) 5; Soldat Martin (mitrailleur), 5; Marl. d. l. Rousseaux (mitrailleur), 5; Cne Lacour-Grandmaison, 5; Sous Lt. Languedoc, 5.

French "Trump" Pilots who have gone under.

Adjt. Lenoir, 11 machines; Sergt. Sauvage, 8; Sous Lt. Pégoud, 6; Sous Lt. de Rochefort, 6; Sous Lt. Delorme, 5; Maréchal des logis Hauss, 5.

GERMAN SUCCESSES.

Capt. von Richthofen, 44 machines; Lt. Woss, 24; Lt. Schaefer, 19; Lt. Baldamus, 15; Lt. Wolff, 14; Lt. Höhdorf, 12; Lt. Dossenbach, 12; Lt. Kirmaier, 11; Lt. Pfeiffer, 9; Lt. von Bulow, 9; Lt. Bernert, 8; Lt. Hans Schilling, 8; Lt. von Althaus, 8; Lt. Berthold, 8; Lt. Hans Muller, 7; Lt. Walz, 6; Lt. von Eschwege, 6; Lt. Theiller, 6; Lt. Immelmann, 6; Lt. Höhne, 6; Lt. Max Muller, 5; Lt. Reimann, 5; Lt. König, 6; Lt. Götsch, 6.

German "Trump" Pilots who have gone under.

Capt. Boelke, 40 machines; Lt. Wintgens, 18; Capt. Immelmann, 15; Lt. Frankl, 14; Capt. Buddecke, 10; Lt. Mulzer, 10; Lt. Leffers, 10; Vizfeldwebel Mänschott, 9; Capt. Berr, 9; Lt. Böhme, 8; Lt. Parschau, 8; Lt. von Kendell, 7; Lt. Fahlbusch, 5; Lt. Rosenkrantz, 5; Lt. von Sedlitz (observtr.) 5.

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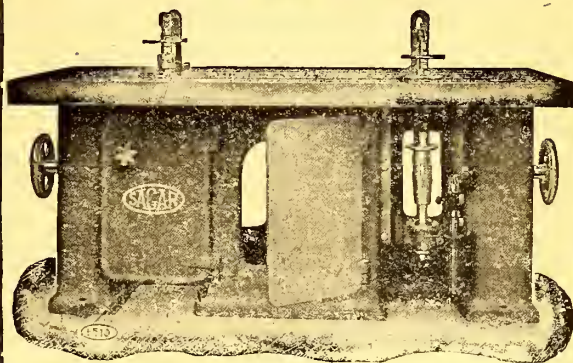
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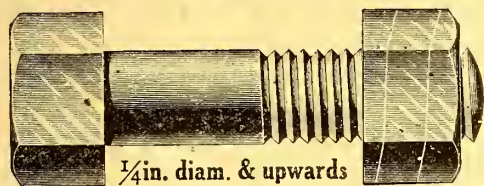
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THE EXHIBITION IN MANCHESTER.

Readers of *THE AEROPLANE* in the Manchester district should not on any account fail to visit Lady Drogheda's exhibition of aeronautical pictures, relics, and war trophies, which will be on view at the Whitworth Galleries, Whitworth Park, during Whit-week and the week after. The exhibition has already visited Birmingham, Coventry and Liverpool, with notably good results, so that the R.F.C. hospitals and Lord French's approved war charities will undoubtedly profit to a very great extent. Several interesting German machines will be on view.

A TRIBUTE TO THE R.F.C.

A soldier on active service who is keenly interested in flying writes:

"I think that as far as skill in flying is concerned it is a thing almost of the past. [Meaning that all are now so skilful that there are hardly any exceptional performers.—Ed.] Nowadays you can see even the largest of battleplanes caper about in the air like kittens on the hearthrug at home. And this is done even with big Bosche shells flying around them. Several of us only yesterday evening were laughing our sides out at the way they were teasing the Hun, and even letting off a drum or two to make him skip.

"This is largely due to the splendid workmanship at home and the deep interest the mechanics take in their machines. Some weeks ago I saw a machine leave an aerodrome, and I had just walked about a mile away from it when I met the pilot coming back shaken by a fall. The mechanic was almost in tears when he came up to the machine just as if he had lost a faithful horse at the hunt or a race, or in a battle charge.

[It is interesting to have this independent evidence of the keenness of the R.F.C. mechanics, the value of whose work is but little realised by the ordinary person otherwise interested in aviation.—Ed.]

PRESENTATION AEROPLANES.

It is officially announced that a sum of £10,000 has been given by the Government of the Gambia for the purchase of fighter aeroplanes, for the use of the Royal Flying Corps. The aeroplanes bought with this gift will be named after the colony.

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And all is wrapped in gloom and silence drear;
Then Sol flings forth his tender golden beams
O'er Windermere.

Swiftly the dawn arouses all to life,
The curlew's plaintive note shrills faint but clear;
And soon a seaplane scorns its aqueous nest
On Windermere.

Quickly 'tis sweeping o'er the placid scene,
Its magic hum still drowsy humans hear:
The pilot spies fair Nature at her best
O'er Windermere.

Ah, he may fly the world both far and wide,
But to this first fair glimpse he'll still adhere,—
He'll ne'er forget when first he tried his wings
O'er Windermere.

F. E. B.

WAR WORK.

An opportunity is offered to capable women between the ages of 18 and 35 at the Willesden Polytechnic, Priory Park Road, Kilburn, N.W., of training in woodwork for aeroplane factories. Women receive a month's training, during which period they are paid 15s. a week. At the end of that time they are drafted into factories, where they receive a minimum wage of about 28s. to 30s. per week to begin with.

A CHANGE OF ADDRESS.

John Remer and Co., Ltd., the well-known timber merchants, wish to notify the Trade that their address at present is, and in future will be, Cunard Buildings, Liverpool, and that their telephone number is Bank 9004 (Liverpool), at which number they have a private branch exchange. It will be remembered that this paper recently noted that the constitution of the firm had been reorganised and the present move evidently indicates a very live policy on the part of the firm in the future.

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ANSWERS TO CORRESPONDENTS.

On account of the labour involved in replying to questions from correspondents, many of which in the past have been answered over and over again by post, it has been decided to answer inquiries of general interest in the columns of THE AEROPLANE. Inquiries should be addressed to The Editor, 166, Piccadilly, W.

READERS BY THE HUNDRED.—If you want any information about joining the R.F.C., write to the Director-General of Military Aeronautics, The Air Board Office, E.C.

* If you want any information about joining the R.N.A.S., write to the Director of Air Services, The Air Board Office, E.C.

Men in the Army, and ratings in the Navy can only obtain commissions in their own branches or transfers to other branches by permission of their immediate commanding officers, who must forward those applications through the proper official channels.

Civilian applicants for commissions in the R.F.C. enter through the Cadet Wings, and are trained to fly at the Government's expense.

Applicants for commissions in the R.N.A.S. enter as Probationary Flight Officers, and are trained at Government expense.

If you are blind or partially blind, or have to wear glasses for any serious reason, you cannot become a Naval or Military aviator.

If you have had special technical training, are over 35 years of age, and attain the necessary social standard, which is not high, you may with luck become a Stores Officer R.N.A.S., or an Equipment Officer R.F.C., even if your sight is defective and you are physically deficient in other respects.

Information concerning appointments as viewers or examiners or inspectors in the Aeronautical Inspections Department may be obtained from the Chief Inspector, A.I.D., The Air Board Office, E.C.

A. A. (Bromley).—1. It is not desirable to publish any further details of the Handley Page biplanes beyond those which have already appeared in THE AEROPLANE. The type is steadily improving, and the publication of scale drawings or details might inform the enemy of more recent practice. It is also undesirable to publish particulars of certain aero-engines, although examples of them are in the hands of the enemy, for the above reason, and for the additional reason that their designers may not be anxious freely to give the result of much study and research to rival manufacturers in this and other countries, be they Allies or Neutrals.

2. The full dress uniform of the R.F.C. is not yet familiar. It is a curious cross between infantry, cavalry, and artillery full dress. Its basis is a lancer's jacket with pale blue plastron and overalls.

3. Air sickness from wind gusts is not common among passengers in aeroplanes, except in very rough weather—at any rate, the discomfort is considerably less than at sea in a wind of equal strength. As a matter of fact, it is very largely a matter of individual temperament. Some people would get sea-sick in a hydraulic lift or on a wet pavement.

4. Many experiments have been made, from 1908 onwards, with steel airscrews. There is certainly much to be said for the system, and more may be heard of the idea in the future. There are certainly constructional difficulties to be overcome, especially the effects of centrifugal force, which imposes terrific strains on the blades on a propeller, and timber has been employed to the exclusion of steel, because it has been found to stand so well up to its work.

5. Your disappointment with the type of book on Aviation, which is so common, namely of the bright and hearty variety intended for the edification of small boys and of spinsters who have had a two-guinea thrill on a box-kite, is very natural. It is perfectly wonderful to contemplate the enormous number of futile books which have been written upon this subject. I think, however, if you buy "The Aeroplane Speaks," by Captain H. Barber, R.F.C., you will receive something worth the money. Its price, post free, from The Wm. Dawson Publishing Co., Ltd., is 7s.

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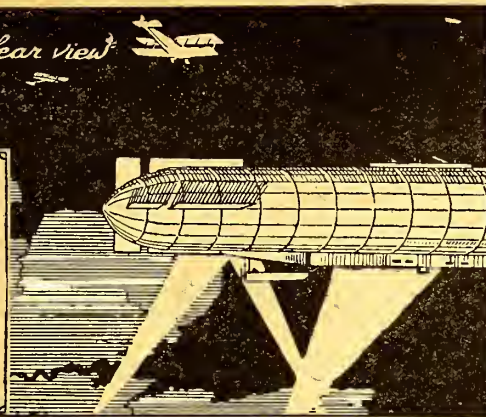
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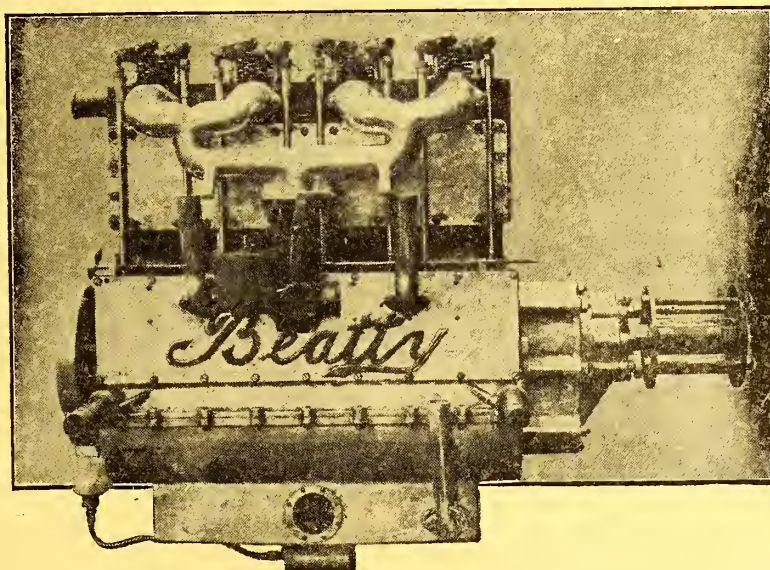
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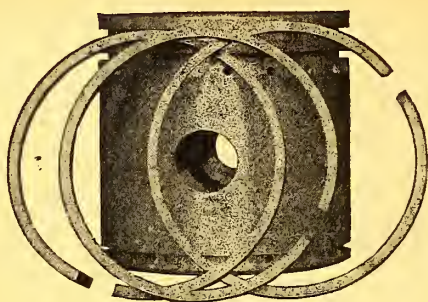
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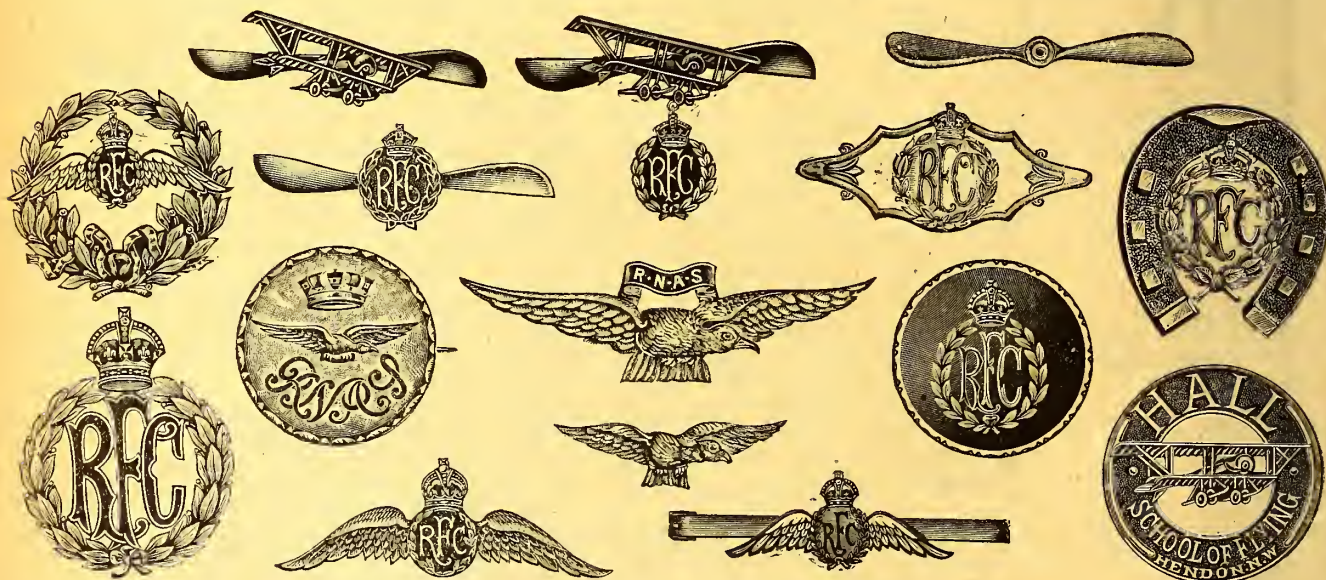
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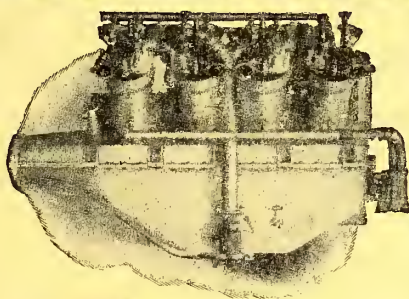
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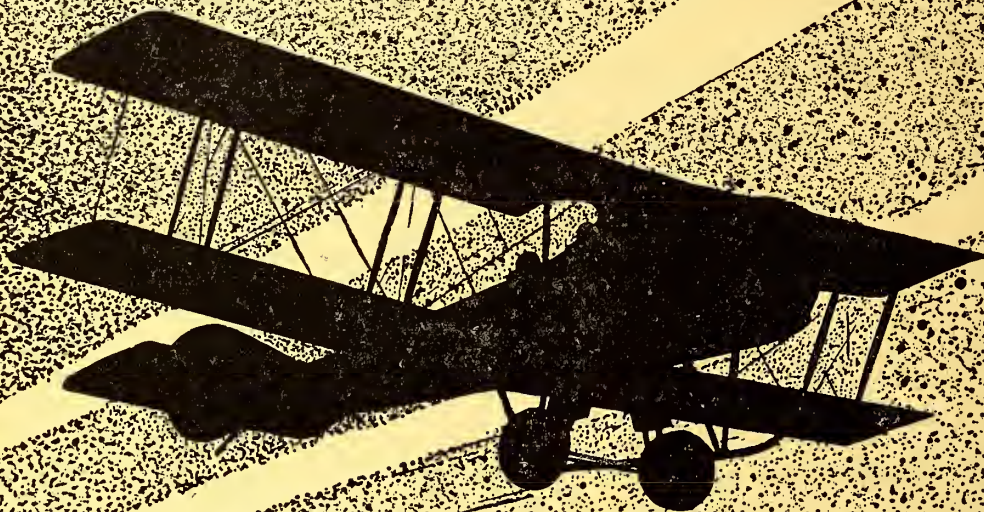
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ON COMMERCIAL AERONAUTICS.

Personally it seems to me at least a debatable question as to whether the time has yet come to devote much time or thought to the question of Commercial Aeronautics. Seeing that the war is still far from being over, although it may be assumed that the result of the war is no longer in doubt, it may well be argued that all our thoughts and energies ought to be devoted to the winning of the war, and that, so far as those of us connected with aircraft production are concerned, we should concentrate our whole ability on supplying the Flying Services with the best possible aeroplanes and engines.

On the other hand, arguing from the admonition, "In time of peace prepare for war"—a doctrine most carefully ignored by those rulers with whom we have been afflicted in the past—we may equally well act on the complementary injunction, "In time of war prepare for peace," so long as the preparations for peace do not affect the efficiency of those concerned with the successful prosecution of the war. On those grounds we may justify logically the discussion of Commercial Aeronautics rather as a mental exercise, by way of relaxation from the strenuousness of war work, than as a definite work of its own.

One might call the discussion a spare-time hobby, but for the fact that none has any spare time in these days, or rather none ought to have any, so one prefers at the moment to regard the consideration of Commercial Aeronautics rather as a change of occupation calculated to give salutary rest to war-burdened minds. Yet indubitably the organisation of Commercial Aeronautics in the future will be a task worthy of the best intellects in the world.

THE DOVE OF PEACE.

Civilian flying after the war will be a much greater factor in history than most people imagine. Lord Cowdray put the essence of the matter in epigrammatic form on Wednesday evening when he said, "The Merchant Service in the past has connected the nations of the world. The Commercial Air Services of the future will bind them together." In other words, the aeroplane will be the real dove of peace.

It is now many years since I argued in this paper that a properly organised air fleet of adequate size could make war impossible by striking at the sources of armament supply. The map reproduced from THE AEROPLANE of September, 1911, and shown by Mr. Holt Thomas in the course of his lecture as demonstrating how much warning we had of the possibilities of aeroplanes six years ago, serves to show that some of us knew what was coming, and realised what could be done with aeroplanes as weapons of offence. But I confess that the binding together of nations by airlines came to me as a new but perfectly obvious truth last week.

How often in one's youth does one fight another whom one does not know, and become his bosom friend when one gets to know him better. It is very seldom that a boy at school fights a really big fight with another more than once. Either the two become good friends, or one becomes the master for ever after. Generally they become friends because they learn to know one another.

LACK OF KNOWLEDGE.

It is not otherwise with nations. After the brutal and ignorant Saxons had smashed up Roman civilisation and destroyed the roads, each little tribe fought every other little tribe. When the Normans conquered the lot—and a good job too—each baron fought every other baron. But when roads were again developed, people came to know one another better and fought each other less.

So long as Scotland was inaccessible, the English fought the Scots; but when better roads and railways came into existence, the Scot found it much easier to plunder the Englishman peacefully and legally than *vi et armis*. The English gave up fighting among themselves because they found that they were all much the same kind of amiable fool together, and they have continued to fight Ireland ever since, chiefly because the Englishman hates being seasick or badly fed or uncomfortable, and has been prevented from close communication with, or intimate knowledge of, the Irish people by the Irish Channel, the Irish hotels, and the Irish roads and railways. The Englishman does not fight with the Manxman, because, despite the sea, Douglas has hotels and dancing-halls, and a promenade, and the Isle of Man has good roads.

The quick and comfortable journey to France and the excellence of the French hotels and roads has had more effect on this war, by causing the French and English to know and esteem one another, than has had all the diplomacy of our Ambassadors, from that great man King Edward VII downwards.

Given a decent aeroplane service to Lhasa and a few first-class hotels in that interesting city, and in a few years we shall have an *entente cordiale* with the Grand Lama and his polyandrous subjects of Thibet—whose social code might well find favour with some Society people.

Quite seriously, though, it is an axiomatic truth that people who know one another intimately do not fight; either they are friends or they simply avoid one another. Therefore, rapidity of communication between nations must make for peace and bind peoples together as Lord Cowdray said. Which is no argument against General Branner's belief in a big air fleet, so powerful that no other nation dare attack us.

CONCURRENT DEVELOPMENT.

One or two speakers after Mr. Holt Thomas's lecture

gave one the impression that they regarded Commercial Aeronautics as the sole line of development for aircraft after the war. It will be well for those in high places strenuously to combat this line of thought.

The development of commercial aeroplanes and of war aeroplanes—and airships—must be pushed forward concurrently. When peace breaks out we may be afflicted by a pacifist Government which will desire to disband our Flying Services, or reduce them to a negligible size. Such a policy would be disastrous.

This war is not Armageddon. It is not even a dress rehearsal for Armageddon. Let us get firmly into our heads the philosophy of that great Chinese Mandarin who, when asked what he thought about the Great World War, replied, "We in China pay little attention to the clan-fights of Western barbarians." Let us remember that this is not a race-war. It is a fight between clans of the same race, with small fractions of other races drawn in accidentally.

Some day the great race-war will come. And if our Air Fleet is not then equal to its task, God help us!

Most of us are heartily sick of the war, chiefly because we are disgusted at the way it has been mismanaged by our various business Governments, but the fifth and sixth forms at our Public Schools are terribly afraid lest it should be over before they are old enough to get their commissions. The fighting spirit still lives, thank Heaven, and we shall not all become pacifists to be slaughtered like sheep by the younger and more numerous races in time to come. But we must be careful, after this war, to see that no ignorant pseudo-Socialist majority prevents the development of our Aerial War Fleet of the future.

To-day we cannot give our land and sea Services all the aircraft they need. Only after peace comes can we begin to build up a real Air Fleet. Therefore, the development of commercial aircraft and of war aircraft must go hand in hand, as General Brancker said last Wednesday.

UNDUE OPTIMISM AND PESSIMISM.

Also do not let us be unduly optimistic or pessimistic about the development of Commercial Aeronautics. Lord Cowdray's remark to the effect that for all Mr. Holt Thomas's enthusiasm he did not feel inclined to sell his railway stocks was well timed, though naturally it was seized upon by several papers as an argument against commercial aeroplanes. It would be a mistake to let people run away with the idea that aeroplanes are going to do all the heavy goods carrying of the future, or that they are going to compete with railways or motor-cars over short distances. For heavy haulage railways will always hold their own, though improved roads will cut down their passenger traffic for distances up to 100 miles, and aeroplanes will damage their passenger traffic for distances over 200 miles still more seriously.

Passenger traffic on railways will mainly consist of high-speed local traffic on electrified lines, and of what would to-day constitute third-class passengers over the longer distances, though first-class traffic will be carried over distances which are too long to be covered in comfort in a car and not long enough to give the aeroplane any advantage when one takes into consideration the time necessary to get to and from the aerodromes. For instance, between London and Birmingham an aeroplane would have little advantage over a fast car or a two-hour express. Between London and Manchester the aeroplane would have a distinct advantage, being able to cover the distance in two hours or less, instead of four. And between London and Edinburgh the advantage would be still greater. But railways will always hold the heavy goods traffic, which

is what earns their dividends, though shareholders do not know it. On many railways luxurious passenger traffic is practically a dead loss.

OVER-SEA JOURNEYS AND POSSIBLE BREAKDOWNS.

It is, however, in journeys involving a cross-Channel passage that the aeroplane scores most heavily. London to Paris takes six hours at least, because of delay in trans-shipping and the slowness of the steamers. By aeroplane the journey can be done in well below three hours. Loudon to Dublin takes ten hours, whereas an aeroplane would do it in four at most.

A friend of mine has raised the objection that aeroplanes, like railway rolling stock and automobiles, are liable to mechanical breakdown. True. But multiple engine aeroplanes will fly with an engine or two out of commission—as witness a Handley Page machine, piloted by Mr. Clifford Prodder, with four people on board, which, when one engine stopped as it was just getting off the ground, climbed, turned against the thrust of the engine, and flew across country to another aerodrome. And the big passenger machines will have several engines, none being forced at full power, as in war time, so that absolute breakdown is unlikely. Moreover, their journeys will be of such short duration that the machines will be inspected at very short intervals, and so be all the safer.

My friend, having no faith in commercial human nature, objects that mere commercial aerial transport firms will not inspect the machines as carefully as the Services inspect their war machines. He is wrong. They will inspect them more carefully and more intelligently. A purely passenger service must depend for its existence on its reputation for safety, so its inspection will be rigid and thorough in defence of that reputation. The Cunard owes its high status among steamship lines, and its consequent dividends before the war, to the fact that it could boast that it had never lost a passenger at sea. The reputation and the profits of aerial transport lines will depend upon similar internal efficiency. The aerial liner will not be in the same class as the heavily insured tramp of the "Bolivar" type immortalised by Mr. Kipling.

ALLIED ROUTES.

A point in Mr. Holt Thomas's lecture which cannot be too strongly emphasised is that dealing with the laying out of air lines after the war over the territory of the Allies. It is interesting to notice on the map of Europe which appears on page 1448 that, though a few direct routes from France and England to Russia and the Far East lie across Germany and Austria, the Central Powers can be avoided easily by going through France and Italy and Turkey—for none regards Turkey as a permanent enemy. Even Turkey can be avoided by going to the East by way of Africa and Arabia. And Russia can be reached through Scandinavia.

On the other hand, Germany and Austria cannot run air lines to any other part of the world except Scandinavia, without having an amicable arrangement as to landing grounds with the various Allied countries. Which may well be an important argument when the time comes to discuss peace terms.

PIONEERS OF COMMERCIAL AERONAUTICS.

Incidentally, I wish to recall to the minds of those who will some day write aeronautical history that very early in the day—in 1910, I think—Mr. Edwards, a far-seeing lawyer of Southampton Street, Strand, was concerned with the formation of a company known as A.I.R. Ltd.—which stood for Aeronautical Investment and Research—whose chief object was the establish-

ment of landing grounds along what must become the chief air lines of Great Britain.

The whole scheme was beautifully worked out on lines which to-day or to-morrow would make it a business proposition. All proper provision was made for sheds, repair shops, and so forth. But, of course, it was at least eight years too early, and came to nothing. Possibly Mr. Edwards' may revive it after the war, if he has not by now given up aeronautical interest in sheer disgust.

Another pioneer effort worth recalling is the "totally" enclosed" Avro biplane of 1912. This was an ideal passenger machine. In it the passenger and pilot could sit and smoke in peace without cigarette ash being blown into their faces. The view out of the machine was sufficient for passenger purposes, if not for military, and so far as comfort was concerned it was far before any military machine of its day.

It should be placed on record that during the Military trials, the late Lieut. Wilfred Parke, R.N., being his pilot, Mr. H. V. Roe took up in this machine a typewriting machine and on it made notes continuously of a journey round and about Salisbury Plain between Lark Hill and Upavon. That, I think, may fairly be claimed as a sound idea for a commercial aeroplane.

CRITICISMS OF THE LECTURE.

Naturally, critics of Mr. Holt Thomas's lecture are not lacking. My friend whom I have already quoted, being himself a business man, says that the argument was not sufficiently forcible, and that, as he said, "it was not a company-promoter's argument." Mr. Massac Buist, writing in the "Morning Post," says, on the other hand, "Not a single scientific observation was made during the whole evening." And some people who have been in the Aircraft Industry for years have said, "He didn't tell us anything we didn't know before."

Which three criticisms seem to show that Mr. Holt Thomas struck just the right note. He did not flourish the financial bait to the company promoter, he did not inflict on his audience the pseudo-science of the "aeronautical expert," and he did not go over their heads with ideas so advanced as to be novel to the old hands of the aeronautical world. He just talked plain sense to be understood of the people.

And it will be well to remember that the more important part of his audience were not the experienced members of the Aeronautical Society, but the distinguished gentlemen on the platform behind him and the equally distinguished and influential guests of the Society in the front rows. Also, it is well to recall Colonel O'Gorman's very sound remark to the effect that an hour's lecture only gave Mr. Holt Thomas time to sketch the outlines of the subject. If one wished to go into any detail at all, it would be necessary to give a separate lecture on each of the points raised by Mr. Holt Thomas. Moreover, in order to say as much as he did in the time it was necessary for him to speak quickly, and therefore his audience had little time in which to let each point sink in for reflection. Therefore I strongly recommend everyone to read his lecture carefully and reflect on each subject raised.

The lecture, as it appears in this issue of THE AEROPLANE, is longer than it was as delivered, for Mr. Holt Thomas omitted several interesting paragraphs in order to save time, and he interpolated others, which I have incorporated in the printed version.

AN INTERPOLATION.

Serious though the evening was, it did not lack its humours, for those who had the luck to drop across

them. One fortunate friend of mine happened to be sitting next a fair damsel who was presumably on the staff of one of the big aircraft constructing firms—evidently a most knowledgeable young woman who deserves promotion. She watched the kinema pictures of the Aerial Post with intelligent interest, and when the imitation post-office officials began carrying out bag after bag of imitation mails to the Ford "G.R." van she smiled gently to herself. After the last postman had stuffed the umptieth bag into the van she turned to her male escort and remarked, "I suppose those are the Government alterations to their latest standard type machine."

That jest, I think, deserves precedence over even Colonel O'Gorman's story of Mr. Holt Thomas's ominous financial success in the earliest days of aviation at the first Reims Flying Meeting, and over General Henderson's priceless phrase—the very last words of the evening—when, seemingly, with memories of official discussions on aviation at councils, committees, and boards, and in Parliamentary debates afflicting him, he remarked that it was only at meetings of the Aeronautical Society that people talked sense about aeronautics.

FALLACIOUS CRITICISM.

Referring again to Mr. Massac Buist's criticisms in the "Morning Post," I fear this able writer must have had a very bad dinner, or no dinner at all, before going to the lecture, for his criticism seems purely destructive, without being of the "house-breaker" kind which clears the way for improvement. He says, "It is abundantly plain that the Society could not hope to maintain its reputation, far less to justify its continued existence, if it were to continue wholly in the manner in which the proposition of commercial aeronautics was handled on Wednesday evening."

That is simply childish. None supposes that the lecture was a contribution to science. It was merely an excellent and simple setting forth of the A.B.C. of the subject for the education of aeronautical infants. And it may be well for Mr. Buist and other clever young men to remember that the aeronautical infants include all the High Authorities of the world, from Ambassadors down to our Park Lane millionaires.

Mr. Buist's argument that preferential treatment of the Aircraft Industry and that Government subsidies for air lines are "equivalent to demonstrating the fact that aeronautics is not commercial in the present, nor will be in the immediate future," is a pure fallacy. Perhaps Mr. Buist will explain the difference between a protective tariff and a Government subsidy.

Will he argue that the manufacture of sugar under a Government bounty is not a commercial proposition? Will he demonstrate that it was not a commercial proposition to build our great passenger liners under a Government subsidy? For they would never have been built without, and then we should never have had them in time of war for our brilliant transport people to play with, and turn from cargo-boats to transports and then into hospital ships, and so forth and so on. Will he argue that subsidised mail-boats to Ireland and elsewhere are not a commercial proposition?

There is no doubt that the Aeronautical Society would be delighted to listen to a lecture by Mr. Buist on "How Commercial Aeronautics May Be Commercialised." He has had such long and intimate knowledge of the Motor Trade that I feel sure he could teach the Aircraft Industry a great deal about how to sacrifice its ideals to its exchequer, or its conscience to its coffers.

I agree, however, with Mr. Buist as to the desirability of preventing company promoting as company promot-

ing after the war, and, if this paper survives till then, the company promoter will find it one of his best enemies. Existing firms of good standing and respectability will be able to do all that will be needed for several years to come, with their existing capital and premises, and except for a few new aerial transport companies—some are already registered by firms of high importance—there will be little enough room for

newcomers. The Aircraft Industry is now very well able to look after itself, I think.

Meantime the Aircraft Industry, and all concerned therewith, will find it to their ultimate advantage to think about Commercial Aeronautics very seriously whenever they find it necessary to switch their minds off the prosecution of the war for a brief and necessary rest.—C. G. G.

Unwarranted Criticism and Some Suggestions for Home Defence.

Though this paper cannot be accused of sparing criticism where criticism has been required, it must be acknowledged that it has been careful to give full credit where credit was due. Therefore one seems at liberty to criticise the criticism of others when it is unwarranted. On June 1st there appeared in the "Daily Mail" a letter from a Mr. Sidney Low, of 24, Marlborough Hill, N.W.8, solemnly advising us to "take a leaf out of the book of our gallant and clear-headed friends the Italians," and to set up observation posts "placed, if possible, on some lofty tower or natural elevation, manned by trained observers, and connected by telephone and telegraph with the nearest aerodrome." After making the highly original disclosure that warning of approaching enemy aircraft is given by "a very loud and distinctive blast, sounded by a siren," he says, "Surely all our vulnerable south-eastern and eastern counties ought to be watched for hostile aircraft, not by coastguardsmen or gunners, but by trained observers of the R.N.A.S., with the sailor's and the airman's eye. If there are not sufficient natural or artificial vantage-points available, they might be supplemented by 'sausage' balloons, moored along the coast and able to command a wide outlook over the eastern horizon." He winds up with the brilliant suggestion that, "As things stand it looks as if we might have the Taubes dropping bombs some fine afternoon upon Oxford Street and Piccadilly before anyone in London is aware of their presence."

Now, if there is one department of our Home Defence Forces which is pre-eminently efficient, it is that which deals with the Observation system. One may not indicate how it works or where it works, but its machinery operates with the regularity and precision of a high-class watch. Therefore, Mr. Low's letter, which is in effect an unwarranted criticism of our observation system, based on profound ignorance of his subject, had better not have been written, though, perhaps, there is more excuse for him than there is for the paper which published it.

The promptness with which our Home Defence aeroplanes have gone up to meet Zeppelins whenever they have arrived bears witness to the effectiveness of the system which has to supply their aerodromes with immediate information of the whereabouts of the airships. The absence of warning siren-blasts in South-Eastern towns has nothing to do with the observation system. The matter of warnings is one to be decided entirely by the local authorities. Certain North-Eastern and Midland towns have decided to use sirens, others have decided that such warnings are undesirable, as they may cause anxiety and disturbance of mind to the people on many occasions when enemy airships turn back or away from the town without reaching it.

THE FAR HORIZON.

Mr. Low's anxiety for elevated observation posts and kite-balloons so that observers may have a clear eastern horizon is amusing. Perhaps he will take the trouble to work out the horizon for an aeroplane at 15,000 feet, and let us know what kind of telescope would be necessary to see an aeroplane at the distance. Somehow his ideas remind one of a certain air-mechanic R.F.C., who, in the early days of the war, started firing with a revolver at a Hun aeroplane flying over his aerodrome at some 6,000 feet, and then, suddenly thinking that his bullets might be falling short, proceeded to stand on a petrol tin to get greater elevation.

Any ordinary open field gives all the horizon any observer can need. It might perhaps be well to use a kite-balloon over a town, merely as a listening post, so as to get the observer away from street noises, but it would be simpler and cheaper for him to sit in a quiet field outside the town, as the field would not need hydrogen nor handling parties.

The "eastern horizon" idea is in itself a fallacy, for in the case of the Folkestone raid the Hun machines came over from the landward side and went out to sea. Apparently, after giving people elsewhere the impression that they were going for another objective altogether they suddenly turned and attacked from the rear, so Mr. Low's religiously eastward-gazing observer would probably have received a bonob in the back of the neck.

As for his R.N.A.S. observers, with "the sailor's and the airman's eye," how many trained observers does he think that the R.N.A.S. could spare? The suggestion that an R.N.A.S. ob-

server should have anything in common with a sailor is not without humour. Incidentally, the man with one sailor's eye and one airman's eye would be an interesting study for an optical surgeon. And why the R.N.A.S., anyway, seeing that the R.N.A.S. has now nothing to do with Home Defence above high-water mark?

Finally, why should Germany presume to send Taubes to London, seeing that the Taube type aeroplane has been obsolete for nearly two years? Surely, Mr. Low's contempt for our Home Defence system is not so great as to justify him in suggesting that the Germans estimate our defences so lowly that they would invade us with aeroplanes which are slower than Zeppelins.

WHY WASTE THEM?

However, the prospects of aeroplane raids have to be faced, unless their places of concentration in Belgium can be bombed out of existence. The R.N.A.S. people at Dunkirk seem to be setting about the job pretty seriously since the Folkestone affair, though they could doubtless have done it long before, if anyone in authority had wanted them to do it.

Even so, the chances still exist of sporadic raids by a few machines just landing at advanced bases in Belgium to fill up with fuel, and starting again before they can be stopped, so, presumably, we ought to do something to meet them if they arrive.

It would be a waste of first-class pilots and machines to keep experienced fighters over here on the off-chance of a raid coming once a month. But, contrariwise, it would be a waste of perfectly good Hun targets to let them come over and go away again unattacked. It occurs to one that any such raiders as arrive might at least be made useful while they are here.

A HUMBLE SUGGESTION.

Those who heard General Branker's highly interesting lecture on our training system, some months ago, will remember his reference to our method of sending picked pilots from the ordinary advanced training schools to one or other of the special "scout schools" where they are trained to fly the high-speed single-seat fighters, beginning with the older type Bristol and progressing to the latest meteoric vehicles. It might be a good idea to locate all these scout schools somewhere near the coast inside the clearly defined area covered by the radius of action of German raiding machines.

Then whenever a raid was signalled, all our little budding Immelmans and Guynemers could chase off into the sky to look for Huns—and I fancy the odds would be on their bagging some of them. It would be quite useful training for the lads in every way. Their slightly obsolete fighting machines would probably be quite fast enough to tackle a Hun bomber still carrying his bombs and enough fuel to take him home again.

And they would have no need for the acrobatic fighting which is the vogue in France when tackling the latest Hun destroyers.

The experience would be good for them, because they would be up against something about their own class, and so it would not be trying them so high as sending them out for their first fight on strange machines, over Archie at his best, to bump straight into von Richthofen's or von Bülow's Circus. Thus they may combine business with pleasure, and indulge in a sporting little fight, while, at the same time, protecting His Majesty's lieges who are occupied in the national industry of shopping.

I feel sure that the "scout schools" will approve my suggestion for the utilisation of Hun raiders as targets for them, so perhaps someone will hand the idea further along.

And if the Hun gets hold of this suggestion, as he certainly will, let us hope he will come gaily over under the impression that he is only going to meet a lot of pupil-aviators. He will enjoy himself. I know some of those pupils.—C. G. C.

CONDOLENCES.

The death took place in London on May 31st of Mrs. Samson, wife of Mr. Charles Leopold Samson, solicitor, of Manchester and London, and mother of Wing Commander Samson, R.N.

The ratings of the Royal Naval Air Service owe much to Mrs. Samson for the work she did in 1915 and 1916 on behalf of the Royal Naval Air Service Comforts' Fund raised by Mrs. Sueter. All will join in sympathising with Commander Samson in his loss.

. The .

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AN AIR MINISTRY AND COMMERCIAL AERONAUTICS.

BY "BERKELEY."

It has been announced during the week that the Viscount Cowdray has resigned his office as President of the Air Board owing to the increased pressure of private business. The news-prints of the day, carefully prompted by prospective candidates, prophesy with equal daring and equal ignorance the names and qualifications of those who are available to accept the vacant post. It is a position with apparent political advantage in that it is constantly in the public eye. With it lies the direction of the newest development of importance in the art of war.

In the absence of precedent a welcome freedom of action is possible. The President of the Air Board, if possessed of personal talent, has great opportunities that rarely come to a politician. His office, criticised though it may be, is free from interference. It is shielded by a veil of secrecy impenetrable even by the malcontents of the House of Commons. But the time has arrived when its powers and sphere of action might with advantage be defined clearly and with precision.

WHAT IT WAS AND IS.

There is a considerable body of aeronautical opinion which has pronounced itself in favour of the creation of an Air Ministry so constituted that with it would lie the direction of a great single Air Service comparable in its national position with the Army and the Navy. Another body of opinion held that it was proper to leave the advancement of aeronautics in the hands of the two great Services, each of which would make the necessary arrangements for aerial arms, and would divide between them the entire responsibility for the maintenance of an aerial offensive.

The general public, entirely lacking any degree of knowledge directly bearing on the subject, demanded something, they knew not exactly what, but something different from the existing conditions. In order to calm the public and to silence, even temporarily, the critics, the Air Board came into being.

At first it was an advisory board with no powers. Later, when criticism revived, it was reorganised and empowered to co-ordinate the production of matériel for the two Services, that neither the Navy nor the Army should at any moment gain the monopoly of aircraft output. The respective urgency of orders was to be settled by the Air Board, and each Service had perforce to be satisfied with the decision.

The Board is responsible for the co-ordination of the supply of matériel, and not for any part of operations. By its means soldiers and sailors have lived in comparative amity within the walls of a great hotel, and the affairs of the world have proceeded as usual.

AN ANALOGY.

The formation of an expensive and top-heavy Board for so limited a purpose can hardly be justified under any standard of statesmanship. If aeronautics require such a formation, then it can at least be argued that every other section of the supply of munitions of war should be controlled by a separate office responsible only to the Cabinet.

The building of ships for the Navy and for commerce might with advantage have a separate controller (not the Shipping Controller), in order that the rapacious claims of the Board of Admiralty should not overwhelm and displace the due rights of the civilian shipowners. And so throughout the various supplies that are required by the two Services and commerce.

A POSSIBILITY.

The Ministry of Munitions might properly have taken over the supply of aircraft with the assistance of those officers who at present assist at the Air Board offices. The Ministry has during the past months of war acquired an extensive knowledge of the trade resources of Great Britain, and is equally capable with the Air Board of deciding the claims of the two Flying Services.

An expensive organisation would thus be saved. A well-sounding name would disappear from the world of politics, but that is all. However, that solution of the difficulty was not accepted, and the Air Board, for good or evil, is part of the national government.

A TEMPORARY EXPEDIENT.

At present, for the reasons briefly outlined above, the Air Board is purely a war-time organisation. The necessity for the co-ordination of orders will cease with the war, for in days of peace the factor of time loses its importance.

Beyond the co-ordination of supply the Air Board has no duties that are apparent, save, perhaps, the advertisement by alphabetic signs of daring pilots in the country's Flying Services. With peace the Board will cease to exist. It will be regrettable if, despite the limited necessity for its initial formation, the accumulated experience and created precedent of the Air Board be lost to the country when the excitement of war is no longer present to incite the nation to methods of efficiency.

TELEPHONIC EVIDENCE.

It may be that the Government intend at an opportune moment to bend before the imperial will of the nation's journalists and create an Air Ministry from the ashes of the Air Board. Optimism is so common a failing of the British that one cannot place too much reliance on the prophetic manner in which the telephone operators at the Air Board offices invariably answer telephone calls with the phrase "Air Ministry." Yet it may be that they are premature only, and that one day their reply will be justified. If so, it is worth while to consider the possible spheres of activity open to such a Ministry.

A POSSIBLE FUTURE.

In the case of the Air Ministry coming into existence it is probable that a separate Air Service will be formed independent of the aerial arms of the Army and Navy. If so, in accordance with the recent logic of statesmanship, its administration will fall to the Air Ministry. Its personnel, training, supply of matériel, and so on will all be directed by the responsible Minister and his board of advisers. In common with the Army and the Navy, its strategic employment will be directed on broad lines by whatever body may succeed the present War Cabinet.

But this part of the work of the Air Ministry, as the most obvious, is of the least interest at the moment. Public opinion, nebulous in its logic and emphatic in its expression, will make or mar this third Air Service in so far as it is able. It is the commercial side of the work of such a Ministry that will need far greater prominence if real results are to be gained.

COMMERCIAL UTILITY.

With the end of the war, and the possible contemporary ending of the now newly formed committee on Commercial Aeronautics, there will be an immediate



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attempt to make use of the aeroplane in the furtherance of trade. Passenger carrying and the transport of cargo by air will begin at once if the necessary facilities are given. The management of the many questions in regard to the commercial employment of aircraft should fall within the duties allotted in the initial charter given to the Air Ministry.

It will be generally admitted that the commercial use of aircraft will depend for its early success on the assistance given by the Government in the formation and operation of various aircraft routes. The aeroplanes in use should be Government property manned by Government personnel. The passenger and freight charges could be put at a figure which would admit of profitable trading, that the commercial interests of the country matter proper to this possible Air Ministry.

INTERNATIONAL PROBLEMS.

But before these routes could be decided upon there would be a vast number of intricate international problems to be settled. It is simple to decide upon an aeroplane service between Paris and London, but it is not so easy to put it into operation. Either country might reasonably object to the free passage of aircraft over its territory. The conditions suitable to one country might not please the neighbouring Government.

International aerial boundaries will constitute a very great question when the war ends. Some check must of necessity be put on the free passage of aircraft over the different countries of the globe. Universal peace is not likely for generations to come, even if it be possible that so Utopian a vision may ever approach realisation.

As aircraft improve their offensive powers will increase to a degree at present incalculable, and it is not likely that any nation would view with equanimity the possibility of a declaration of war being announced by a devastating attack from the air. Hence it will be essential that safeguards shall be given between nations against such a possibility.

SAFEGUARDS.

These safeguards cannot be a simple matter of international treaty unless accompanied by some concrete scheme for preventing the breach of such an agreement. Treaties have been and ever will be without binding effect when treated apart from international interest.

THE FIFTH WILBUR WRIGHT LECTURE.

The Secretary of the Aeronautical Society, Mr. W. Barnard Faraday, announces that the Fifth Wilbur Wright Memorial Lecture will be delivered at the Grafton Galleries, Grafton Street, W., on Wednesday next, June 13th, at 8 p.m.

The lecturer will be Lieut.-Col. Mervyn O'Gorman, C.B., and his subject will be "Foresight in Aeronautics: Technical, Political, and Financial." The chair will be taken by the Right Hon. Lord Sydenham of Combe.

The lecture should draw a large audience, for Colonel O'Gorman is always a delightful speaker, combining humour with originality of ideas to a remarkable extent. His long and close connection with aeronautical affairs, together with his intimate knowledge of official views on the subject from the beginnings of military aeronautics, have given him unrivalled opportunities of studying prophecies and the fulfilment thereof, so that his views on foresight in aeronautics in the various aspects indicated should be well worth hearing.

Tickets for the lecture should be secured at once from the offices of the Aeronautical Society, 7, Albemarle Street, W.1.

By the way, was there not, some time ago, some question of the Grafton Galleries being placed out of bounds for military officers? One hopes that the prohibition has been removed, for though it might lend excitement to the proceedings, it would be a pity if the lecture were interrupted by a visit from the Provost-Marshal, and the distinguished Service members of the Aeronautical Society removed under escort. However, the horrid thought need not deter anyone from attending what is bound to be a most interesting lecture.

A treaty is effective so long as there are means available of imposing its terms, and no longer.

Therefore in aerial matters safeguards beyond "scraps of paper" are essential. How they are to be devised is not capable of settlement in the columns of this paper, nor, to claim omniscience for a moment, in any Chancery in Europe. When the time arrives it will be for the Air Ministry to contrive the necessary means and to arrange for their future use through the Foreign Office.

REVENUE AND LICENCES.

Then there are the questions relating to Customs dues. No country, unless free trade becomes a world-wide principle of statecraft, will care to lose the great revenue properly accruing from cargo passing in or out of the country by aircraft. For initial encouragement Customs dues may be waived on goods so transported, but progress in aeronautics is so rapid that the relaxation cannot be of long duration. The method of collection of this part of national revenue is another matter proper in this possible Air Ministry.

As aerial navigation increases in importance it will be necessary to arrange for certificates similar to those issued to officers of the Mercantile Marine, that those who are in charge of aircraft may be known to have reached such a standard of airmanship as will ensure the safety within human limits of those who may take to the air as passengers. The brevets issued by the Royal Aero Club will soon become entirely inadequate for the purpose, apart from the fact that such certificates have no official value. The navigation of the air will soon become as intricate and as comprehensive as that of the sea. The issue of navigation certificates may properly fall to the Air Ministry.

AN ALTERNATIVE.

These briefly sketched points are but a few of the innumerable questions of high importance which will demand settlement at the outbreak of peace. It may save time and labour if their elucidation is left to a properly constituted Air Ministry.

On the other hand, it would no doubt be better statecraft to constitute a Ministry of Commerce, of which an important department would be devoted to aerial questions of the nature outlined above. The naval and military use of aircraft would then be left to the Navy and Army. But that is another question.

THE WORLD'S AIR ROUTES.

Colonel Lord Montagu of Beaulieu, C.S.I., will deliver a lecture on "The World's Air Routes and their Regulation," at the Central Hall, Westminster, on Thursday, June 21st, at 7.45 p.m. for 8 o'clock promptly. Lord Montagu will be glad to send invitations for reserved seats to those interested in aviation and its development on application to him at 62, Pall Mall, S.W.1., or to the Secretary, The Aeronautical Society, 7, Albemarle Street, W.1. A certain number of seats will be thrown open to the public on the night of the lecture. There will be no charge for admission.

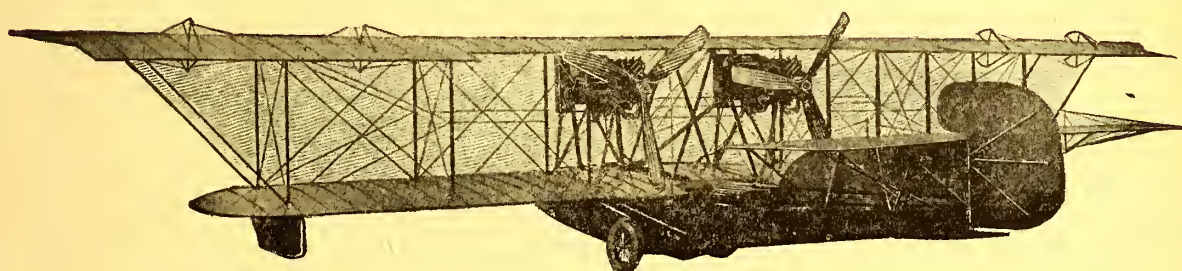
Lord Montagu will deal with some of the problems which must arise from the navigation of the air, such as how aircraft are to be guided on their journeys over land, sea, and air, between continents and over continents. He will foreshadow the kind of regulations which must be made to prevent collisions, and what regions of the air are to be considered as private or prohibited areas, and as national and international areas. Some world routes will be considered in detail, and practical time-tables put forward showing how passengers will arrange their journeys from China, India, or South Africa to England.

It is understood that Lord Montagu will also deal with some of the meteorological aspects of flying, and will demonstrate how certain winds will assist regular services all over the world.

The lecture will be illustrated by large-scale maps, lantern slides, and diagrams, and should be well worth hearing, for not only is Lord Montagu a keen student of aeronautics, but he knows the world geographically as very few people know it, so that his views are those of the man on the spot. His recent experience of aviation in India, for example, is a proof thereof.

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A ROYAL VISIT.

The King and Queen, accompanied by Princess Mary and attended by Comdr. Sir Charles Cust, R.N., on May 31st motored to Hendon and paid a long visit to the Aircraft Manufacturing Company's Works, and to the Hendon Aerodrome. The works employ a large number of hands, chiefly women.

The Royal party had a loyal welcome from the workpeople. They were received by Major C. S. Paulst, of the Ministry of Munitions; Major Ivan Dobson, Captain R. H. Brand, Mr. G. Holt Thomas, managing director; Mr. H. Burroughes, general manager; Mr. G. A. Peck, assistant general manager; Captain S. W. Hiscocks, chief engineer; and Captain de Havilland, the famous designer.

The works have increased in size enormously since the beginning of the war, and their Majesties spent several hours in going from shop to shop. They saw everything under normal conditions and talked with foremen, forewomen, and individual workers as they passed through, showing the deepest interest in details.

The Queen asked a girl worker to explain how the various fabrics in use were handled and herself used the scissors in cutting some of it. Their Majesties saw the assembling shop, the seaplane department, the erecting shops, the "dope" room—where the King remarked on the excellence of the ventilation, for "as a rule," he said, "these places smell most unpleasantly"—the plane-covering shed, the wood-workers' and the machine shops.

All the Royal party minutely examined the many new labour-saving tools employed. The Queen was particularly interested in a neat tool for driving screws, which saves both time and labour, and was pleased to accept one as a souvenir of the visit. It was explained that most of the foremen were the original employees of the firm when it was in its infancy.

Their Majesties afterwards motored to the Aerodrome at Hendon, where they were received by Major Lord Robert Innes-Ker, Commandant. Detachments of the Royal Flying Corps and the Royal Naval Air Service were on the ground. A number of flights in the latest types of machines were made, Captain Hucks going up on a new "de H." He looped many times, and gave one of his best displays of acrobatic flying, of the kind now necessary on active service. The King conversed with the pilot for some time on his return. Other machines were sent up, including one which holds a record for speedy climbing.

A machine was put up by the R.N.A.S., and the pilot turned and twisted, side-slipped and looped in a fashion most disconcerting to witness, but showing how perfectly under control the machine was. Two machines gave an exhibition of air fighting.

The King and Queen then walked to the naval sheds. On their leaving the workpeople crowded into the roadway and cheered their Majesties most heartily.

THE PRESIDENT OF THE AIR BOARD.

The Press Association made the following announcement on June 2nd:—

It is understood that the number of posts affected by the Ministerial rearrangements pending is to be added the Presidency of the Air Board. Viscount Cowdray, who succeeded Lord Sydenham six months ago, is desirous of retiring for business reasons as soon as another chairman can be appointed.

All will regret the retirement of Lord Cowdray, who has won the confidence and respect of all concerned with aeronautics. His engineer's mind quickly grasped the difficulties of the task before him, and he grappled ably with the problem. Great improvements have already been effected under his guidance, and everyone had great hopes that here at last was the man to organise efficiently the equipment of the Flying Services. What business reasons can have been so important as to induce him to withdraw his services from the work of the Empire can only be a matter of surmise.

A successor will not be easily found. The only name publicly mentioned as a likely occupant of the post is that of Mr. Winston Churchill, on whom a vicious attack was made in the "Morning Post" on June 4th. If Mr. Lloyd George is strong enough to stand up to Mr. Churchill's enemies, we may see him appointed, and one cannot think of anyone better fitted for the position.

Mr. Churchill is one of the very few men of Cabinet rank in this country who has been proved to possess foresight and originality of thought. His mobilisation of the Fleet before the beginning of the war saved something like a disaster to this country. His rapid movement of R.N. reserves to Antwerp held up the German advance long enough to allow of most important moves being made on the left flank of the Allies at very small cost. His attempt to capture the Gallipoli Peninsula failed through bad management for which he was not responsible, and if the attempt had succeeded it would have had a most important effect on the war in our favour. Above all, he is the one man of Cabinet rank who is not only keenly interested in aeronautics but who has had real experience of flying, and a wide practical knowledge of aircraft. Whether the present heads of the Flying Services could possibly work amicably with Mr. Churchill is another matter, but if they could do so it is certain that the Air Board would be a stronger body than ever it would be likely to be under any other combination of chiefs.—
c. G. G.

A WELCOME VISITOR.

Among the "war Americans" who have recently visited this country has been Mr. Grover C. Loening, the well-known writer on aeronautical affairs, and a technician of note. Mr. Loening came to this country on a semi-official mission, and in the course of an all too short visit—from our point of view, at any rate—met practically all the people chiefly responsible for aeronautics in this country. While here he visited many of the most important and well equipped works in the country, as well as the chief naval and military stations, and he flew in several of our very latest aeroplanes, which, incidentally, are at least as good as anything the Germans have, and are probably better, because better made.

While here Mr. Loening impressed all who met him not only with his sound knowledge of aeronautical science in all its branches, but with his absolute freedom from prejudice both as regards national methods and as regards different types and uses of aircraft. He combines in a remarkable degree firmness of opinion with openness of mind and an insatiable thirst for information with the power to select and digest information absorbed.

The United States is to be congratulated on many of the representatives of American aeronautics who have visited this country, but on none more than on Mr. Grover Loening, whose rapidly acquired knowledge of all that is best in European aeronautical practice should be of the highest value to the Authorities at Washington, if they, unlike their British equivalents, are willing to take advice from those who know.

Mr. Loening was called back to the States by urgent business at short notice, and as he had no time to take leave personally of the friends he made during his short stay, he wrote, just before his departure:—"Please give my very best regards to the many friends I had the pleasure of meeting, and I want to assure you that the courtesy and cordiality which I encountered will long bear most pleasant memories."

On behalf of all who met him, one can assure Mr. Loening that the pleasant memory is mutual, and that his friends in this country hope that ere long he will return, having aided materially in the production of that Air Fleet with which America can do so much to accelerate the end of the war.—C. G. G.

A LONDON-ROME FLIGHT.

A message from Rome on May 30th states that a British biplane arrived at the Centocelle aerodrome at 6.20 that evening after a successful flight from London. Stops were made in Paris, Turin, and Pisa.

The aviators were warmly welcomed by a large number of Italian officers.


Another message from Rome, dated May 31st, states that Sir Rennell Rodd, the British Ambassador, gave a reception on May 30th in honour of the British aviators.

The aviators left Rome on May 31st at 4 p.m.



Captain Baron von Richthofen, whose death in action is rumoured, leader of the most famous of the Mobile Destroyer Squadrons which are familiarly known in the R.F.C. as "traveling circuses."

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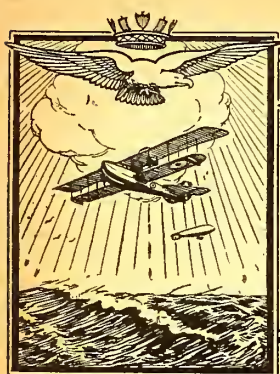
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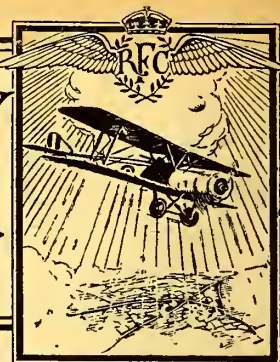
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FROM THE "LONDON GAZETTE."

WAR OFFICE, May 28th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Flt. Comdr.—Capt. L. L. MacLean, Ind. Army, from a Flying Officer, April 18th.

Balloon Co. Comdr.—Graded as a Flt. Comdr.—Sec. Lt. (temp. Lt.) H. F. Wright, Spec. Res., from a Balloon Comdr. (graded as a Balloon Officer, and to be temp. Capt. whilst so employed), May 3rd.

Special Appointment.—Graded as a Park Comdr.—Temp. Sec. Lt. J. Rubie, D. Gds., from Adjnt., and to be temp. Maj. whilst so employed, May 18th.

MEMORANDA.—Following from R.F.C. to be Sec. Lts. for duty with R.F.C.:—Actg. Sgt.-Maj. L. E. Carter, Flt. Sgt. E. Hiscock, May 30th.

SPECIAL RESERVE OF OFFICERS.—SUPPLEMENTARY TO REGULAR UNITS OR CORPS.—R.F.C.—MIL. WING.—Capt. C. G. Bell resigns his commn. on account of ill-health, and is granted hon. rank of Capt., May 30th.

* * *

ADMIRALTY, May 29th.

Temp. Flt. Lt. J. E. Minifie, R.N., who has relinquished his appointment on account of injuries sustained on active service, to retain his rank.

* * *

WAR OFFICE, May 31st.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Flt. Comdr.—Temp. Lt. N. B. Fuller, Gen. List, from a Flying Officer, and to be temp. Capt. whilst so empld., May 23rd.

Adjts. Sec. Lt. (temp. Capt.) H. P. Maybury, Midd'x R., T.F., Jan. 8th. Capt. F. Steel, Essex R., Spec. Res., Feb. 10th. Lt. E. Duveen, Spec. Res., from a Flying Officer, vice Capt. W. H. C. Ramsden, E. York. R., April 24th. Temp. Lt. S. Henderson, Essex R., and to be transfd. to Gen. List, vice Sec. Lt. (temp. Lt.) D. G. Nairn, A.S.C., T.F., April 29th. Sec. Lt. W. L. Burt, Essex R., T.F., to be secd., and to be temp. Lt. whilst so empld., May 1st. Lt. G. C. Pulman, Lond. R., T.F., and to be secd., May 5th. Capt. G. R. Newton, Manch. R., T.F., and to be secd.; Capt. G. F. Earle, Rif. Brig., and to be secd., June 1st.

* * *

WAR OFFICE, June 1st.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld.:—Temp. Sec. Lt. T. P. H. Bayetto, Gen. List; Sec. Lt. J. B. McCudden, M.C., Gen. List, May 1st.

MEMORANDA.—The following from R.F.C., to be temp. Sec. Lts. for duty with the Military Wing of that Corps:—1st Cl. Air Mechanic D. G. Trenerry, Actg. Cpl. L. Whistler; 1st Cl. Air Mechanic W. I. Prothero, 2nd Cl. Air Mechanic G. Feeny, Flt. Sgt. W. F. Wood, Cpl. J. H. Gladding, Sgt. P. H. Morrish, May 9th.

TERRITORIAL FORCE RESERVE.—The following officers from R.F.C., and to retain their seny.:—Lt.-Col. M. J. P. O'Gorman, C.B., to be Lt.-Col., Sept. 30th, 1916. Maj. A. R. Martin to be Maj., Dec. 12th, 1916. Maj. C. K. Butler-Stoney to be Maj., Feb. 21st. Capt. R. Whiddington to be Capt., Nov. 22nd, 1916. Capt. S. W. Hiscocks to be Capt., Jan. 31st. Lt. A. J. Elliott to be Lt., Dec. 31st, 1916. Lt. S. J. Waters to be Lt., Feb. 5th. Sec. Lt. R. S. Burch to be Sec. Lt., Sept. 16th, 1916. Sec. Lt. W. Laidler to be Sec. Lt., March 8th.

Maj. F. M. Green to be Capt., with precedence as from Dec. 1st, 1915. (Dec. 31st, 1916), (substituted for that which appeared in "Gazette" of April 19th).

* * *

WAR OFFICE, June 1st.

The following names are among those mentioned in sixth and last Supplement containing Sir Douglas Haig's Dispatch of April 9th, submitting names deserving of special mention.

AN ADDITIONAL LIST.

The following names were received too late to be included under their respective units:—

Grattan-Bellew, Maj. W. A., M.C., Conn. Rang. and R.F.C. (died of wounds).

Graves, Maj. E. P., R.A. and R.F.C. (killed).

Harvey-Kelly, Maj. H. D., D.S.O., R. Ir. R. and R.F.C.

Leighton, Maj. J. B. T., M.C., S. Gds. and R.F.C. (died of wounds).

Magawly, Cerati de Calry, Capt. (temp. Lt.-Col.) V. A., D.S.O., R.F.C. and Dns. (killed).

* * *

From the "London Gazette," Supplement, June 1st.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign. The King has given unrestricted permission in all cases to wear the Decorations and Medals in question:—

Presented by the President of the French Republic

LEGION D'HONNEUR.

CROIX DE CHEVALIER.

Lt. (temp. Capt.) A. Ball, D.S.O., M.C., Notts and Derby R. and R.F.C.

Capt. the Hon. M. Baring, R.F.C., Spec. Res.

Sqdn. Comdr. G. R. Bromet, D.S.O., R.N.A.S.

Capt. (temp. Lt.-Col.) R. C. Donaldson-Hudson, D.S.O., T.F. Res., and R.F.C.

Temp. Maj. A. C. B. Geddes, M.C., R.F.C.

CROIX DE GUERRE.

Temp. Lt. (temp. Capt.) G. W. M. Green, M.C., R.F.C.

Temp. Capt. F. M. Hicks, R.F.C.

Sec. Lt. R. E. Buckingham, R.F.C., Spec. Res.

Sec. Lt. C. T. Repton, Hrs., att'd. R.F.C.

* * *

WAR OFFICE, June 2nd.

REGULAR FORCES.—Wt., N.C.Os., and Men to be temp. Sec. Lts.:—MEMORANDUM.—For duty with R.F.C.—Sgt. W. B. Thomson, from R.F.C., May 4th.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Staff Officer, 1st Cl. —Graded for purposes of pay as an A.A.G.—Maj. N. D. K. MacEwen, Arg. and Suth'd Highrs., and to be temp. Lt.-Col. whilst so empld., April 4th.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts. whilst so empld.:—Sec. Lt. S. Collier, Ches. R., T.F., May 7th. Sec. Lt. (temp. Lt.) J. M. Child, Manch. R., May 12th. Temp. Sec. Lt. H. D. Davis, Gen. List, May 14th. Temp. Lt. E. P. M. Robinson, Gen. List, May 18th.

* * *

BIRTHDAY HONOURS.

His Majesty has been pleased to confer the honour of knighthood upon:—

Richard Tetley Glazebrook, C.B.

[Sir Richard Tetley Glazebrook has been Director of the National Physical Laboratory since 1899. He is a Fellow of the Royal Society and of Trinity College, Cambridge, and he was formerly Principal of University College, Liverpool.]

The King has been graciously pleased, on the occasion of His Majesty's birthday, to give directions for the following promotions in, and appointments to, the Most Distinguished Order of Saint Michael and Saint George, in recognition of valuable services in connection with the war:—

C.M.G. (ADDITIONAL).

Maj. and Bt. Lt.-Col. (temp. Brig.-Gen.) J. M. Salmond; D.S.O., R. Lanc. R. and R.F.C.

Maj. (temp. Lt.-Col.) G. Livingston, Lond. R. and R.F.C.

* * *

His Majesty the King has been graciously pleased to approve of the following reward for distinguished service in the field, dated June 3rd, 1917:—

To be Brevet Lieut.-Col.:—Major (temp. Lieut.-Col. G. W. P. Dawes, D.S.O., R. Berks R. and R.F.C.

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His Majesty has been graciously pleased to approve of the undermentioned rewards for distinguished service in the field:—

TO BE COMPANIONS OF THE D.S.O.

Temp. Capt. W. W. Benn, Yeo., attd. R.N.A.S.
Capt. (temp. Lt.-Col.) the Hon. J. D. Boyle, Rif. Brig. and R.F.C.
Lt. (temp. Maj.) R. A. Cooper, Yeo. and R.F.C. (late Capt., D.G.).
Capt. (temp. Maj.) L. F. R. Fell, R.F.C., Spec. Res.
Maj. A. L. Godman, York R. and R.F.C.
Capt. (temp. Maj.) J. H. A. Landon, Essex R. and R.F.C.
Capt. (temp. Lt.-Col.) R. Loraine, M.C., R.F.C., Spec. Res.
Capt. and Bt.-Maj. (temp. Brig.-Gen.) G. S. Shephard, M.C., R. Fus., attd. R.F.C.
Capt. (temp. Maj.) J. Valentine, R.F.C., Spec. Res.
Capt. (temp. Lt.-Col.) P. K. Wise, R. War. R. and R.F.C.

* * *

WAR OFFICE, June 4th.

The following additional Birthday honours are published:

BAR TO THE MILITARY CROSS.

Lt. (temp. Capt.) P. C. Sherren, M.C., Can. Local Forces and R.F.C.

THE MILITARY CROSS.

Sec. Lt. (temp. Capt.) G. B. A. Baker, R. Berks R. and R.F.C.
Sec. Lt. R. E. Buckingham, R.F.C., Spec. Res.
Temp. Capt. W. W. Carey-Thomas, Gen. List and R.F.C.
Sec. Lt. (temp. Lt.) F. O. Cave, Rif. Bde. and R.F.C.
Temp. Capt. J. Clisdal, Gen. List and R.F.C.
Temp. Capt. E. J. Henderson, R.F.C., S.R.
Temp. Capt. C. Holland, R.F.C., Spec. Res.
Temp. Sec. Lt. P. C. Hollingsworth, Gen. List and R.F.C.
Temp. Lt. (temp. Capt.) H. D. Jensen, Gen. List and R.F.C.
Sec. Lt. E. King, K.O.S.B., Spec. Res., attd. R.F.C.
Sec. Lt. M. J. G. Mare-Montembault, Yeo. and R.F.C.
Sec. Lt. (temp. Capt.) H. M. Massey, Notts and Derby R. and R.F.C.
Temp. Capt. H. Meintjes, Gen. List and R.F.C.
Temp. Lt. F. G. Saunders, Gen. List and R.F.C.
Sec. Lt. F. H. B. Selous, R.W. Surr. R. and R.F.C.
Temp. Sec. Lt. (temp. Lt.) actg. Flt. Comdr. E. R. Wilkinson, Gen. List and R.F.C.
Sec. Lt. (temp. Capt.) H. A. Wood, R.F.C., Spec. Res.
CANADIAN FORCES.—Lt. J. C. F. Owen, Can. Local Forces and R.F.C.

FROM THE COURT CIRCULAR.

BUCKINGHAM PALACE, June 2nd.

The King, who was accompanied by the Queen and the Princess Mary, drove to Hyde Park this afternoon, for the purpose of holding an Investiture.

The following Officers and Men of the Navy and Army had the honour of being presented to the King, when His Majesty decorated them with the medals which have been awarded to them.

THE MILITARY CROSS AND BAR.

Capt. Hugh Roy, R. Inniskilling Fus. and R.F.C.

THE MILITARY CROSS.

Capt. Edwin Benbow, R.F.A. and R.F.C.

THE DISTINGUISHED SERVICE MEDAL.

Actg. Air Mech., 1st Cl., Walter Burce.

The King subsequently received

Mrs. Lilian Mottershead, widow of Sgt. Thomas Mottershead, V.C., R.F.C., and handed to her the Victoria Cross which had been awarded in the war to her husband.

The Marquis Camille (His Majesty's Lord Lieutenant for the County of Kent) represented the King at the Memorial Service for those who were killed in the recent Air Raid, which took place at Folkestone to-day.

NAVAL.

The following appointments have been made in the Royal Naval Air Service:—

May 29th.—Temp. commissions (R.N.V.R.) have been granted to the following, seny. May 28th: Lts. Dr. J. C. Mottram and O. H. Mason.

May 31st.—Proby. Flt. Comdr.—R. B. Ward, confirmed in rank of Flt. Comdr., seny. March 30th.

Assist. Paymaster (R.N.).—R. M. Bailey, graded as Proby. Flt. Lt., seny. May 26th.

Leading A.M.—H. F. Jackson, granted a temp. commission as Sub-Lt. (R.N.V.R.), seny. May 27th, and apptd. to "President," addl., for meteorological duties.

The following temp. entries (R.N.V.R.) have been made:—Lts.—R. H. Meers, seny. April 23rd, and apptd. to "President," addl., for R.N.A.S.; F. A. Applebee (apptd. to "President," addl., for R.N.A.S.); E. J. Wickens, and H. W. J. Chipchase, all seny. May 30th.

JUNE 2nd.—Flt. Sub-Lt. (temp.).—G. M. Morse, granted a temp. commission as Lt. (R.N.V.R.), seny. May 31st.

ADMIRALTY COMMUNIQUE.

JUNE 1st.—Several raids were carried out by naval aircraft from

Dunkirk in the course of last night, May 31st-June 1st, the objectives being Ostend, Zeebrugge, and Bruges.

Many tons of bombs were dropped on the objectives with good results.

In every case all our machines returned safely.

JUNE 2nd.—An aeroplane attack was made on the enemy aerodrome at St. Denis Westrem yesterday morning, and last night naval aeroplanes and seaplanes attacked the German bases at Zeebrugge, Ostend, and Bruges, dropping several tons of explosives.

JUNE 4th.—The Commodore, Dunkirk, reports that a bombing attack was carried out on Bruges Dock and Canal during last night with good results.

THE CASUALTY LIST.

Reported May 31st.

Missing.—Houston-Stewart, Flt. Sub-Lt. W., R.N.

Haines, Sub-Lt. C. L., R.N.V.R.

PREVIOUSLY REPORTED MISSING, NOW REPORTED (UNOFFICIALLY) TO BE PRISONERS IN GERMAN HANDS.—Laurence, Flt. Lt. C., R.N.

Bennett, Sub-Lt. L. J., R.N.V.R.

PREVIOUSLY REPORTED MISSING, NOW OFFICIALLY REPORTED KILLED IN ACTION.—Pailthorpe, Flt. Lt. H. A., R.N.

PREVIOUSLY REPORTED MISSING, NOW REPORTED NOT MISSING.—Morris, Flt. Sub-Lt. H. M., R.N.

PREVIOUSLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED A PRISONER.—Mack, Actg. Flt. Comdr. R. G., R.N.

Reported June 4th.

PREVIOUSLY UNOFFICIALLY, NOW OFFICIALLY REPORTED A PRISONER IN GERMANY.—Slater, Flt. Sub-Lt. R. K., R.N.

PERSONAL NOTICE.

DEATHS.

ARMSTRONG.—A verdict of accidental death was returned on June 1st upon Lt. Percy Armstrong, R.N.V.R., formerly gas engineer at Leeds University, and Leading Mechanic Charles Harris, R.N.A.S., who died from injuries received in an explosion at an aerodrome in Kent. Wing Commander Cave-Browne-Cave, R.N., gave evidence that a fire broke out at the top of a gas holder, gas burning from a leak at the top. Sand was thrown on it in an unsuccessful attempt to extinguish it, and water was played to prevent the holder's collapse by heat. Gas was discharged until there was only a few thousand feet in the holder, and the gas was allowed to burn out through the leak. Lieut. Armstrong, who was the gas officer at the station, examined the holder, and he and witness satisfied themselves that there was no flame on the surface of the holder. Twenty minutes later there was an explosion, and witness found the gas holder had blown up and collapsed. The bodies were picked up near by.

Capt. A. P. Davidson said there were no lights near, but a spark might have come from one of the chimneys of the station. A doctor said the two surviving men had regained consciousness, but could not recollect anything of the accident.

DUNCAN.—A verdict of "Accidental drowning" was returned at an inquest held at an East Coast town on June 4th, upon David Alan Duncan, aged 21, a pilot in the R.N.A.S., whose home was at Church Street, Kennington. While he was flying on June 2nd a loud explosion occurred and his machine fell spinning into the water. The aviator, being strapped in his seat, was drowned. An examination of the engine showed that a cylinder had cracked. The deceased was said to be a capable and reliable pilot.

MARRIAGES.

PARSONS—WINGFIELD.—On June 2nd, at St. Saviour's Church, Paddington, Frederick William Parsons, R.N.A.S., eldest son of Mrs. Parsons, of Wood Green, was married to Gladys Katie Wingfield, eldest daughter of Harry Wingfield, Esq., M.A., F.C.A., Ministry of Munitions, and Mrs. Wingfield, of 143, Sutherland Avenue, W.

SUTTON—BRUTNELL.—On June 2nd, at St. Philip's, Sydenham, Francis J. K. Sutton, R.N.A.S., only son of Mrs. W. R. Sutton, of Sunnyside, West Hill, Sydenham, was married to Cicely Graham, youngest daughter of Mr. and Mrs. Brutnell, of Melton Mowbray, by Canon King.

ENGAGEMENT.

TERRY—WILSON.—The marriage arranged between Miss Dorothy Lytton Wilson and Flt. Sub-Lieut. Howard Vivian Terry, R.N., will take place quietly at Goldhanger, Essex, on June 9th.

It was reported that on June 1st two British aviators reached an East Coast seaport in a British warship. They had been flying over the North Sea nearly a week previously, when they were forced to descend. They floated about for five days and nights with nothing to eat but a piece of chocolate which one of them had in his pocket. They were completely exhausted when they were picked up, and are now in hospital.

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ROYAL VISIT TO HENDON.

PILOTS' EXHIBITION FLIGHTS.

The King and Queen, accompanied by Princess Mary, and attended by Commander Sir Charles Cust, R.N., yesterday afternoon motored to Hendon and paid a long visit to the aircraft factory and the aerodrome. The works employ a large number of hands, chiefly women, by whom the Royal visitors were given a loyal ...

... strongly ... Missy Mac ... attend the ... represent ... cannot in ... support or ... Allies.

MY.

TA ... SU ... A forth ... plying

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It is reported that the pilot was Flight Lieut. Harold Morris, R.N., and the passenger an air mechanic.

MILITARY.

G.H.Q. COMMUNIQUÉS.

MAY 29th, 8.25 p.m.—Two German aeroplanes were brought down yesterday in air fighting and six other hostile machines were driven down out of control.

Five of our aeroplanes are missing.

MAY 31st, 8.7 p.m.—Two German aeroplanes were driven down yesterday out of control.

One of our machines is missing.

JUNE 1st, 9.10 p.m.—On the night of May 30th-31st, long-distance bombing raids were carried out by our aeroplanes, with good results, against hostile ammunition depots and railway stations.

In air fighting yesterday, two German aeroplanes were brought down and one other hostile machine was driven down out of control.

None of our machines are missing.

JUNE 2nd, 8.45 p.m.—Our aeroplanes were active again yesterday, and much valuable work was accomplished.

In air fighting one German machine was brought down and six others were driven down out of control.

Three of our aeroplanes are missing.

JUNE 3rd, 9.17 p.m.—Activity in the air continued yesterday.

Four German aeroplanes were brought down in air fighting and five others were driven down out of control. Another German machine was driven down by our anti-aircraft guns.

Four of our aeroplanes are missing.

JUNE 4th, 8.35 p.m.—In the course of bombing raids on the night of the 2nd-3rd inst., our aeroplanes obtained hits on four enemy trains, one of which was completely destroyed.

In air fighting, six German aeroplanes were brought down and one other hostile machine was driven down out of control.

Four of our aeroplanes failed to return.

WAR OFFICE COMMUNIQUÉ.

The G.O.C. British Forces in the Balkans reports:—

MAY 29th.—Operations since the issue of the last communiqué have been confined to artillery and aerial activity.

The R.F.C. and R.N.A.S. have recently carried out several successful raids. Bombs were dropped on Drama, where direct hits on the enemy's aerodrome were observed; also on Livunovo (north-east of Petritch) and several places west of Lake Doiran.

Reported May 30th.

DIED OF WOUNDS.—Fidler, Sec. Lt. C. W., A. and S. Highrs. and R.F.C.

WOUNDED.—Bartlett, Sec. Lt. E. B. W., R.F.C.

Hodges, Lt. A. G. A., North'n R. and R.F.C.

Johnson, Sec. Lt. J. T., R.F.C.

Sanders, Sec. Lt. A. P. M., North'd Fus., attd. R.F.C.

MISSING.—Garrett, Sec. Lt. H. T., R.F.C.

Horncastle, Capt. L. H., M.C., Wilts. R., attd. R.F.C.

Hudson, Sec. Lt. T. J., R.F.C.

NEWFOUNDLAND CONTINGENT.—MISSING.—Blackall, Sec. Lt. J. H. Newfoundland Regt. attd. R.F.C.

Reported May 31st.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Wood, Sec. Lt. G., R.F.C.

PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF WOUNDS.—Lucas, Sec. Lt. A. J., R.F.C.

KILLED.—R.F.C.—Perrott, 65934 2nd Cl. Air Mech. B. G. (South Harrow).

DIED OF WOUNDS.—R.F.C.—Kidney, 8750 2nd Cl. Air Mech. G. W. (Brixton, S.W.).

CANADIAN CONTINGENT.—MISSING.—French, Lt. C. E., East. Ont. R., attd. R.F.C.

Masson, Lt. R. G., East. Ont. R., attd. R.F.C.

Smith, Lt. L. A., Gen. List, attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Baker, Lt. R. P., B.C. Regt., attd. R.F.C.

Reported June 1st.

KILLED.—Gunnery, Sec. Lt. C. L., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Thuell, Sec. Lt. W. J., R.F.C.

Wade, Sec. Lt. O. J., R.W. Kent R., attd. R.F.C.

WOUNDED.—Mundie, Sec. Lt. J., Gordon Hdrs. and R.F.C.

MISSING.—Moody, Sec. Lt. B. C., London R., and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Hervey, Sec. Lt. H. E., M.C., R.F.C.

Knowles, Capt. M. B., London R. and R.F.C.

McDonald, Sec. Lt. D. P., Cam'n Highrs., attd. R.F.C.

KILLED.—R.F.C.—Edwards, 17812 Cpl. R. (Canning Town, E.).

DIED.—R.F.C.—Chapman, 43942, 2nd Cl. Air Mech. H. (Leeds).

Reported June 2nd.

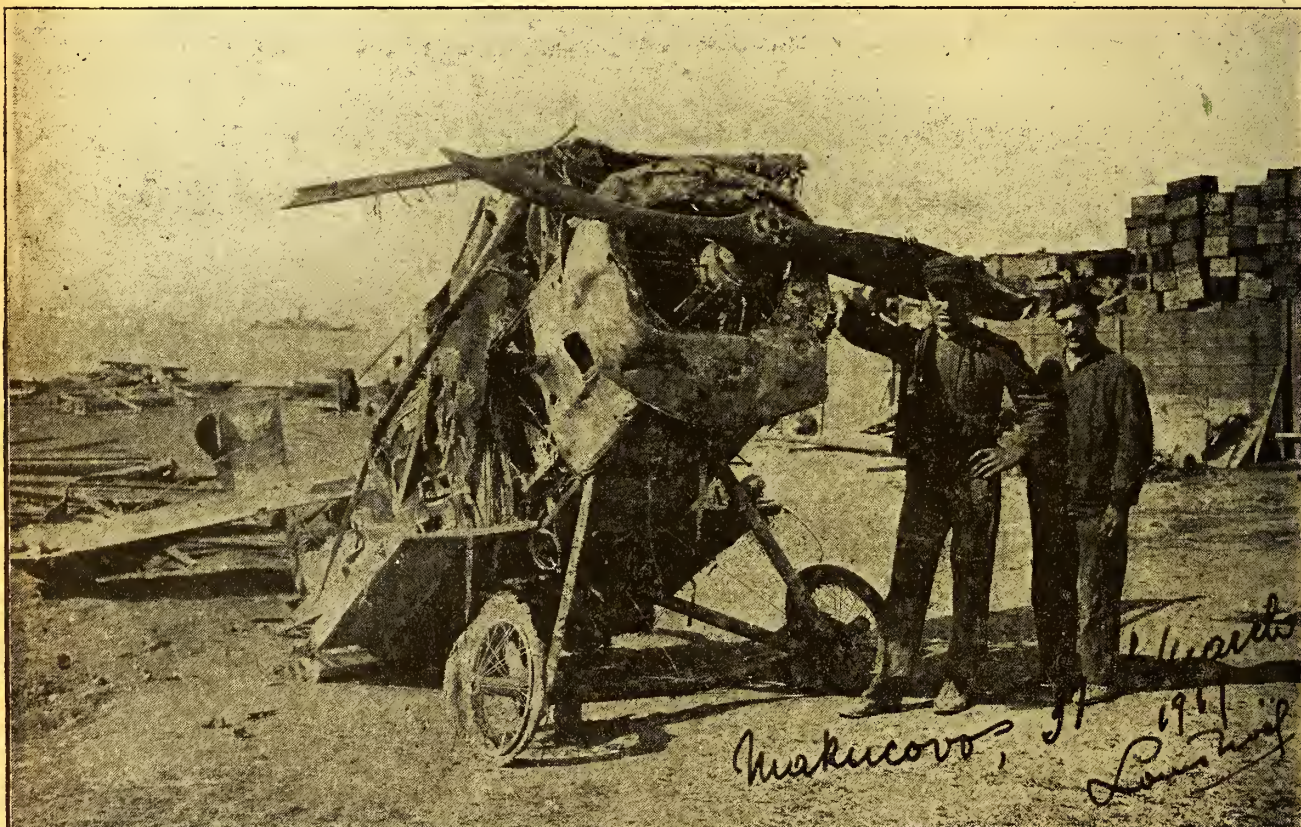
KILLED.—Clark, Capt. W. L., R.F.C.

Diment, Sec. Lt. H. S., R.F.C.

McKimmie, Lt. A., R.F.C.

Stephen, Sec. Lt. J. P., R.F.C.

WOUNDED.—Birch, Sec. Lt. W., R.F.C.



ONE OF THE ALLIES' AEROPLANES WHICH DID RETURN.—A photograph of a Sopwith, which, piloted by Sous-Lieut. Noël, just managed to land between the enemy's and the Allies' lines in the Balkans, where it was heavily shelled, and was rescued after dark.

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 McLeod, Lt. D. W., Gord. High., attd. R.F.C.
 Phillips, Lt. W. O., R.F.C.
MISSING.—Evans, Sec. Lt. F. W., Mx. R., attd. R.F.C.
 Johns, Lt. R. A. P., Hussars, attd. R.F.C.
PREVIOUSLY REPORTED PRISONER, NOW REPORTED WOUNDED AND A PRISONER IN GERMAN HANDS.—Southon, Capt. H. G., R.F.C.
KILLED.—R.F.C.—Giles, 6643 2nd Cl. Air Mech W. E. (Leyton, N.E.)
DIED.—R.F.C.—Drain, 51684 2nd Cl. Air Mech. J. (Bethnal Green, E.)

Reported June 4th.

KILLED.—Brodie, Lt. C. G., Lond. R. and R.F.C.
 Brown, Lt. J. W., R.F.A., attd. R.F.C.
 MacDonald, Sec. Lt. W. F., R.F.C.
 Shackell, Lt. F. C., Cyclist Corps and R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Spence, Lt. W. S., R. Scots, attd. R.F.C.
WOUNDED.—Allen, Lt. L. W., R. War. R. and R.F.C.
 Austin, Sec. Lt. F. H., R.F.C.
 Cogswell, Sec. Lt. E. B., R.F.C.
 Dalziel, Sec. Lt. R. G., R.F.C.
 Davison, Capt. J. F., R.F.C.
 England, Sec. Lt. N. H., R.F.C.
 Fauvel, Sec. Lt. L. G., R.F.C.
 Johnson, Lt. R. E., R. W. Surr. R., attd. R.F.C.
 Jones, Sec. Lt. E. H., R.F.C.
 Kennedy, Lt. S. N. S., Bedf. R., attd. R.F.C.
 Mearns, Sec. Lt. E. A., R.F.C.
 Morgan, Sec. Lt. L. L., Welsh R. and R.F.C.
 Okeden, Lt. H. G. P., R.F.C.
 Stewart, Sec. Lt. C. G., R. Scots Fus., attd. R.F.C.
MISSING.—Eccles, Lt. C. G., R.F.C.
 Gagne, Sec. Lt. J., R.F.C.
 Gilchrist, Sec. Lt. W., R.B., attd. R.F.C.
 Goods, Lt. G. M., R.F.C.
 Holman, Sec. Lt. L., Hrs., attd. R.F.C.
 Jeffery, Sec. Lt. R. E., R.F.C.
 Johnstone, Sec. Lt. J., R.F.C.
 Millar, Sec. Lt. T. S., R. Scots, attd. R.F.C.
 Osborn, Sec. Lt. C. C. F., R.F.C.
 Palmer, Sec. Lt. P. R., Leic. R., attd. R.F.C.
 Turner, Lt. W. G. D., R.F.C.
AUSTRALIAN FORCE.—WOUNDED.—Jones, Capt. A.M., F.C.
CORRECTIONS.—WOUNDED.—Smith, Capt. S. P., A.S.C., should read:—Smith, Capt. S. P., A.S.C. and R.F.C.
 Sellars, Lt. E. L., M.C., March. R. and R.F.C., should read:—Sellars, Lt. E. L., M.C., Manch. R., attd. R.E.

Reported June 5th.

KILLED.—Wood, Sec. Lt. P. J., R.W. Surr. R. and R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Carter, Sec. Lt. F. L., E. Surr. R., attd. R.F.C.
DIED OF WOUNDS.—Jenkins, Capt. C. H., R. Suss. R., attd. R.F.C.
WOUNDED.—Baring-Gould, Sec. Lt. J. H., Yeo. and R.F.C.
 Cole, Sec. Lt. M. B., R.F.C.
 Fowler, Sec. Lt. F., R.F.C.
 Piggott, Lt. J. C. C., D. of Corn. L.I., attd. R.F.C.
 Rodger, Lt. R. C., M.C., R.F.A., attd. R.F.C.
MISSING.—Anthony, Lt. J. R., R. Welsh Fus. and R.F.C.
 Goodall, Lt. J. H. H., York and Lanc. R. and R.F.C.
 Macintosh, Sec. Lt. R. R., R. Scots Fus., attd. R.F.C.
 Toogood, Sec. Lt. J., R.F.C.
KILLED.—R.F.C.—Tollervey, 3284 Sgt. A. G. (Deptford, S.E.)
DIED.—R.F.C.—Prior, 65874 2nd Cl. Air Mech. R. H. N. (Oxford, ford.)

PERSONAL NOTICES.

DEATHS.

BALL.—Capt. Albert Ball, D.S.O., M.C., R.F.C., previously reported missing, is now officially reported killed. He was awarded the D.S.O. on Sept. 26th, 1916, and the same "Gazette" announced the award of a bar to the same. The official record told how on one occasion he dived onto four enemy machines in formation and broke them up, shooting down one; and another time he dived in amongst 12 hostile machines.

The number of enemy machines he brought down is generally estimated to be 40. A short time ago Capt. Ball received the Freedom of the City of Nottingham.

The "London Gazette" of June 1st stated that the French Government had conferred on him the Cross of Chevalier of the Legion of Honour.

CARLTON.—Lt. R. S. Carlton, attd. R.F.C., was drowned whilst boating on the river at Weybridge. He was accompanied by Lt. Hunter, R.F.C., who was rescued, but had to be removed to the Weybridge Cottage Hospital.

Mr. Hunter was rescued by two ladies who were boating in the vicinity. One jumped into the river, while the other remained in the boat, and between them they prevented Mr. Hunter from sinking. Two men came along in another boat and completed the rescue.

Mr. Carlton was the 7th son of J. Crichton and Mary Carlton, 7, Spencer Road, South Croydon. He was aged 22.

CATT.—Sec. Lt. W. E. Catt, of Southborough, near Tonbridge, was flying at a considerable height near his home on June 4th, when his aeroplane nose-dived and collapsed, falling on an apple tree. The officer was badly injured, and died while being taken to hospital. The accident is supposed to have been due to engine trouble.

CHARLESWORTH.—Sec. Lt. Charlesworth, R.F.C., was flying near an aerodrome in an Eastern county on May 30th, when his aeroplane burst into flames and dived to the ground. Mr. Charlesworth was so badly burnt that he died shortly afterwards.

At the inquest on Mr. Charlesworth a verdict of accidental death was returned.

CLARK and FOZARD.—Two aviators lost their lives at Hurst, Berks, on June 1st. Lt. H. F. Clark, R.F.C., was killed outright, and 2nd A.M. William Fozard died soon after being extricated from the wrecked machine. The aviators having lost their way came down. Soon after they had gone up again the aeroplane was seen to be in difficulties and fell.

ECCLES.—Lt. C. G. Eccles, R.F.C., who was killed in action about May 25th, was the son of Capt. R. H. Eccles, The Queen's Own (Royal West Kent Regt.). He was aged 29 years.

EVANS.—Sec. Lt. Henry Cope Evans, D.S.O., R.F.C., reported missing on Sept. 3rd, 1916, in an air fight, and now officially presumed to have lost his life, was the only son of the late W. H. Evans and of Mrs. Evans, of West Point, Camberley. Born in 1879, he was educated at Mr. Fendall's, Woodcote House, Windlesham, and Haileybury. Having gone out to Ontario to learn fruit farming, he enlisted in the Canadian Artillery, and served for a year in South Africa. On returning to Canada he took up ranching near Macleod, Alberta, and he also held a Government appointment as Range Rider. A keen sportsman and fine horseman, he was well known as a polo player, and was one of the early pioneers of the game in Western Canada.

The day after war was declared he joined the Alberta Dragoons as a trooper, reaching England with the 1st Canadian Contingent in November, 1914. He saw much service in France from February to September, 1915, when he was given a commission and attached to the R.F.C. Joining his squadron at the front, he was at once engaged in the fighting from September 25th as an observer. In 1916 he trained in England for his pilot's certificate, returning to the front in June, where he did good service, bringing down several enemy machines. He was awarded the D.S.O. in August, and was also mentioned in dispatches.

His Squadron and Flight Commanders wrote:—"We are all so sorry at losing your son over the lines. He was a gallant and exceedingly successful pilot, and his loss will be keenly felt by all." "... Your son was looked up to by us all as our star pilot; wherever there was a fight he was always in the thick of it. His loss came as a terrible shock to me, as not only was he the bravest of pilots, but also the best of friends."

EZARD.—Sec. Lt. Herbert Henry Ezard, attd. R.F.C., who was accidentally killed while flying, was the elder son of Dr. E. H. Ezard, of Cambridge. He was aged 25.

FLETCHER.—Sec. Lt. Arthur Henry Felix Fletcher, Hussars, attached R.F.C., who was killed in an aeroplane accident on May 22nd, was the eldest son of Joseph Fletcher, late Great Missenden, Bucks, now of Paris. He was 19 years old.

FULLER.—Lt. Leonard A. Fuller, R.F.C., killed on May 17th, aged 25, was the youngest son of Mr. and Mrs. Edward Fuller, Croydon. He was educated at the Whitgift Grammar School and the Imperial College of Science and Royal School of Mines. When war was declared he joined the London University O.T.C., and received a commission in the Durham Light Infantry, transferring later to the R.F.C. His Commanding Officer writes:—"Your son was a very popular and gallant officer, and will be greatly missed in the squadron."

GOODBAN.—Sec. Lt. Montague Sidney Goodban, R.F.C., who was killed in an air fight on May 19th, 1917, was the only son of Mr. and Mrs. S. Goodban, 129, High Street, Clapham, S.W. He was 26 years old.

GUNNERY.—Sec. Lt. Cedric L. Gunnery, R.F.C., whose death was announced last week, was educated at Cholmeley House, Eastbourne, and Marlborough College (C House). On leaving school he entered the London office of the United States Steel Products Company, and joined the Inns of Court O.T.C. on his eighteenth birthday. In August of last year he obtained a commission in the R.F.C., was gazetted flying officer in January, and a few weeks later went to France as a scout pilot. His Commanding Officer writes of him: "It is useless for me to try and write to you the sense of loss felt by the squadron. We have lost one of our best pilots and a very popular officer in your son."

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KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.

HOYLE.—Sec. Lt. W. Maynard Hoyle, the Norfolk Regt., attached R.F.C., who died on May 11th of double pneumonia, was the only son of the late J. Johnson Hoyle, Johannesburg, and Mrs. Hoyle, of "The Fields," Newport, Mon. He was 19 years old.

JOHNSTON.—Sec. Lt. Thomas Peacock Johnston, Yeomanry, attached R.F.C., who was killed in action while flying on May 20th, 1917, was the elder son of the late James Johnston, junr., of 40, Haymarket, London, and Mrs. Johnston, Sudbury, Stoke Abbott Road, Worthing. He was aged 27.

LUKYN.—An adjourned inquest was held at Marylebone on June 4th on the body of Sec. Lt. Stanley Edward Lukyn, 22, Royal West Surrey Regt., who died in the R.F.C. Hospital as the result of injuries received in an aeroplane accident in April. The officer had been under instruction for 10 days, and had been up on several occasions. Capt. Harrison, who was acting as pilot instructor on the occasion, was now well enough to give evidence. He said that he had had six months' experience in France, in addition to a long period in England. The machine had only been in use for 10 days; he had been up in it on several occasions, and considered it one of the finest of the kind he had used. When at a height of about 1,000 feet the machine began to form spirals. He tried to check them, but could not get the control lever over. The aeroplane nose-dived, and he remembered nothing more. He could only account for the accident by the control getting out of order. A verdict of accidental death was returned, and the Coroner and jury congratulated Capt. Harrison on his escape.

MASON.—Sec. Lt. George Mason, R.F.C., who was killed while flying on May 4th, was the eldest son of Mrs. Helen M. Mason, of 50, Oakfield Road, Stroud Green, N. He was aged 17 years and 8 months.

O'SULLIVAN.—Sec. Lt. F. O'Sullivan, N. Staffs Regt., attached R.F.C., who lost his life, at the age of 20, in an aerial fight on April 23rd, was the youngest son of Mr. and Mrs. James O'Sullivan, of High Bank, Burton-on-Trent. He enlisted in the Motor Machine Gun Service early in 1915, and got his commission in November of that year. As an observer he obtained his "wing" in less than two months.

SCHOFIELD.—Sec. Lt. Schofield, R.F.C., was killed recently through his aeroplane nose-diving and falling into a garden at Hungerford.

STEPHEN.—Sec. Lt. James Pedraza Stephen, R.F.C., who was killed in action on May 23rd, was the second son of Mr. and Mrs. A. G. Stephen, Hong Kong and Shanghai Banking Corporation, Shanghai. He was 19 years of age.

ENGAGEMENT.

ROME—STILES.—An engagement is announced between Lt. S. G. Rome, M.C., Argyll and Sutherland Highlanders and R.F.C., younger son of Colonel and Mrs. Geo. Rome, Knock-bay House, Campbeltown, Argyll, and Dorothy Jalland, only daughter of Major Harold J. Stiles, R.A.M.C., and Mrs. Stiles, 9, Great Stuart Street, Edinburgh, and Whatton Lodge, Gullane.

MARRIAGES.

KNOWLES—BERNERS.—On June 2nd, at St. Mary's Church, Hellesdon, Capt. Robert Millington Knowles, M.C., Norfolk Regt. and R.F.C., younger son of the late Andrew Knowles and Mrs. Knowles, of Taverham Hall, Norwich, was married to Olive Marjory, younger daughter of Major and Mrs. Berners, of Hellesdon House, Norwich, by the Bishop of Thetford, assisted by Canon A. J. Spencer and the Rev. Mr. C. A. Hope.

MILLS—BLAKE.—The marriage arranged between Capt. R. N. F. Mills (attached R.F.C.), younger son of Mr. and Mrs. Mills, of Tapton Grove, Derbyshire, and Marjory Frances, younger daughter of Sir Francis Blake, Bart., M.P., and the late Lady Blake, of Tillmouth Park, Cornhill-on-Tweed, and 10, Old Court Mansions, Kensington, took place on June 6th (to-day) Wednesday, at half-past two o'clock, at St. Mary Abbott's Church, Kensington.

BIRTHS.

EVERIDGE.—On May 29th, at Ripon Lodge Nursing Home, Grove Park, S.W., the wife of Capt. J. Everidge, Surrey Yeomanry and R.F.C., of a son.

SIMPSON.—On May 26th, at Twickenham, the wife of the late Capt. Frank Simpson, R.G.A., R.F.C. (killed in action Feb. 16th)—a son, a grandson to Professor W. T. Simpson.

At the Investiture in Hyde Park on June 2nd five aeroplanes formed an aerial guard of honour and a measure of protection against enemy aircraft, an interesting combination of ornament and utility.

Among the posthumous awards was that of the Victoria Cross to Sergeant Thomas Mottershead, R.F.C., who died of burns after bringing back his blazing aeroplane and saving the life of his observer. His widow, Mrs. Lilian Mottershead, received the Victoria Cross from the King.

CORRECTION.—Owing to a typographical error, it was made to appear last week that Major T. Vincent Smith, R.F.C., had been awarded the Italian Order of St. Maurice and St. Lazarus. This officer was, in fact, awarded the Military Order of Savoy.

* * *

A soldier on active service writes:—

"... The other day it was reported that our aviators had shot down a B.E.2E with a Boche pilot in. He had the audacity to bring one of our own machines out, mind you, and look in our lines. I saw him myself, and wondered why, after having left some good large trees close by us on the road, he should try and clip the branches off with an aeroplane. The pilot and passenger were taken prisoners, and so ended their joy ride.

"I have not seen any of their coloured butterflies yet, although an occasional machine, which looks like their Albatros, flies pretty low now and again, and gets a few machine-gun bullets spun at him..."

* * *

A message from Mr. W. T. Massey, written from Gaza on May 24th, contains the following reference to the enemy's air service operating in Palestine:—

This morning an aeroplane, carrying three men, with explosives, came down at Salmena, a few miles from Bir el Abd, to attempt to cut our railway and pipe line. The men alighted, and were about to place the dynamite in position when our patrol opened a heavy fire. The enemy aviators ran to their machine, leaving all their explosives and implements. Blood trails showed that one man was hit. Not the slightest damage was suffered by us.

FRANCE.

OFFICIAL COMMUNIQUÉS.

MAY 29th.—Yesterday seven German aeroplanes were brought down in air fights by our pilots and 12 others, which were seriously damaged, were forced to land in their lines.

MAY 30th.—Two German aeroplanes were brought down by our pilots on May 29th. It is confirmed that another enemy machine was brought down on May 27th in the region of Filain (north-east of Soissons).

MAY 30th.—ARMY OF THE ORIENT.—Our aviators bombarded some Austrian encampments to the north of Devoli (Eastern Albania).

MAY 31st.—On May 30th five German aeroplanes were brought down by our pilots. According to further information five other enemy machines, which were reported damaged during the preceding days, were really destroyed.

JUNE 1st.—To-day two German aeroplanes were brought down by the fire of our anti-aircraft guns, and fell in their own lines.

Between May 17th and 31st, 32 German aeroplanes were completely destroyed on our front in air fights. Moreover, 57 other machines were seriously damaged, and probably crashed to the ground in their own lines.

Capt. Guynemer brought down five aeroplanes, four of them in one day. Two of these machines were brought down with a minute's interval between them, probably for the first time in this war. These five fresh victories bring up to 43 the number of German aeroplanes destroyed up to the present by this gallant officer.

During the same period Lieut. Pinsart put out of action three enemy machines, thus triumphing over his 15th adversary. The following are the names of the other pilots who have added to the number of their victories:—Adjutant Madon, 12th machine; Sous-Lieut. Tarascon, 11th; Adjutant Jailer, 10th; Capt. Matton, 6th; Quartermaster-Sergeant Souiller, 5th.

ARMY OF THE ORIENT.—Much activity by aviators on both sides is reported. Enemy aeroplanes dropped bombs on Florina and Bikovo. British aeroplanes successfully bombarded an enemy camp at Bogdanci (west of Lake Doiran).

JUNE 1st.—ARMY OF THE ORIENT.—The enemy bombarded Kotitza and the railway near Salonika. No damage was done. Our aeroplanes dropped bombs on several enemy camps.

JUNE 2nd.—On June 1st five German aeroplanes fell in flames or were dashed to pieces on the ground as the result of encounters with our pilots.

According to further information, two other German machines were brought down—one on May 27th and the other on May 30th. Adj. Fonck has brought down five German machines up to the present.

ARMY OF THE ORIENT.—There was mutual aerial and artillery activity on the whole of the front.

JUNE 3rd.—On Thursday evening five machines attached to our naval aviation centre at Dunkirk bombarded the enemy's submarine base near Zeebrugge, a squadron of five enemy aeroplanes at Ostend, and an aerodrome at Ghiselles. All our machines returned safely.

JUNE 4th.—During June 2nd and June 3rd our pilots brought down six German aeroplanes and a captive balloon. In addition, our anti-aircraft guns accounted for three enemy machines, the occupants of which, including three officers, were captured.

Some enemy aeroplanes bombarded the region of Nancy and Dunkirk. There were several civilian victims at Dunkirk.

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GERMANY.

OFFICIAL COMMUNIQUÉS.

JUNE 1st.—On May 31st, a squadron of our seaplanes, one of which was manned by Bulgarians, successfully dropped bombs on Sulina, the Rumanian port on the Black Sea. In spite of strong counter-attacks all the machines returned undamaged.

ARMY OF GENERAL VON MACKENSEN.—The enemy yesterday lost four aeroplanes and three captive balloons by air attacks of our aviators.

JUNE 3rd.—During the night May 31st—June 1st English aviators dropped bombs on a camp on our lines of communication which resulted in the death of one French prisoner and in 91 being wounded.

Our flying squadrons dropped bombs with destructive effect on railway works, munition depots, and troop camps before the Aisne front (Reuter version says:—"Arras-Aisne front").

The enemy yesterday lost 10 aeroplanes in aerial encounters and as a result of our anti-aircraft fire.

JUNE 4th.—One of our naval aeroplanes on June 2nd rained bombs on the Russian flying station at Lebara.

RUSSIA.

OFFICIAL COMMUNIQUÉS.

MAY 29th.—AVIATION.—One of our aeroplanes, while performing a scouting operation, was attacked by three enemy Fokker machines, and, after several minutes' battle, fell in the enemy's lines in the region of the village Bilieschi (north-east of Focșani). Pilot Bigelya and Observer Sub-Lt. Taihov evidently were killed.

MAY 30th.—On the night of May 29th our pilot, Ensign Argeev, and observer, Sec. Capt. of Cavalry, Skarsky, dropped 4 bombs on an enemy position in the region of Stanislaui. About 4 a.m. there appeared over Podgaizze 5 aeroplanes, which threw about 40 bombs without doing us injury. Our aviators had an encounter with the enemy. During this engagement our gallant aviator, Ensign Kakorin, was killed.

MAY 31st.—Our aviators dropped four bombs on an enemy patrol near the village of Soli (Libau-Romensk railway) and a like number upon the station at Voigiany (Bologoe-Siedlice railway), where successful results were observed.

JUNE 1st.—AVIATION.—In the direction of Baranovitchi one of our aeroplanes, while making a reconnaissance of a height, fell, and was burnt. In the region north-west of Podgaizze an enemy aeroplane set fire, with incendiary bullets, to one of our observation balloons, which fell in flames. The observer, Ensign Abramoff, perished. In the region of Parziui, west of Tekukiu, one of our aeroplanes was brought down by a German battle-plane, and the pilot was killed.

JUNE 3rd.—German aeroplanes dropped about forty bombs in the region of the station at Luninetz. Our aviator, Lieut. Orloff, carried out a raid in the night on the enemy's position near Stanislaui, dropping a number of bombs.

JUNE 4th.—A German aeroplane was brought down by our artillery in the region of Lake Nobel, and fell in the enemy's territory.

* * *

A Petrograd telegram states that four German aeroplanes on June 1st tried to approach Odessa, but were driven off by Russian aviators. Two enemy machines flew over Minsk, but immediately retired owing to the violent fire of the anti-aircraft batteries. A German squadron of aircraft dropped numerous bombs on Tiraspol and its environs.

AUSTRIA.

OFFICIAL COMMUNIQUÉS.

JUNE 2nd.—On the Isonzo there has only been artillery firing and very lively aerial activity. Our aviators brought down in air fights two hostile planes.

JUNE 3rd.—Italian aviators bombed Trieste and other places in Istria. At Trieste a woman and child were killed.

ITALY.

OFFICIAL COMMUNIQUÉS.

MAY 30th.—On the afternoon of the 28th one enemy aeroplane was brought down in a severe air fight east of Monte San Marco (two miles east by south of Gorizia).

JUNE 1st.—Last night enemy aircraft made a raid on Udine and Cervignano, dropping incendiary bombs. Our anti-aircraft guns put them to flight. Very slight damage was done and one civilian wounded. Our machines in reply successfully bombed the military works of Barcola, north of Trieste, and returned safely.

JUNE 2nd.—Numerous air encounters took place yesterday above Gorizia, and raids attempted by the enemy on the city were all repulsed. One enemy machine was brought down near Aisovizza (four miles east of Gorizia). Also our bombing squadrons of aeroplanes, accompanied by chasing machines, were yesterday very active. Military works, aviation camps, dumps, and railway junctions were successfully bombed from Duino to Opicina, north-east of Trieste. All our machines returned safely.

JUNE 3rd.—Fine weather was favourable to aerial activity yesterday. Enemy aircraft which attempted reconnaissances over our lines in Trentino were driven off by anti-aircraft batteries and by our own aviators. This morning an enemy aeroplane

over Gorizia was brought down and (? another) east of Vertojba.

JUNE 4th.—Along the whole front yesterday there was considerable air activity. One enemy machine was brought down by fire near Mt. Zebio; a second machine fell in flames near Plava; and the pilot of a third was forced by our aviators to descend in his line. During the night enemy aircraft bombed Cadigoro, but there were no victims and no damage was done.

Our squadrons bombed hutments and enemy troops assembled at S. Lucia of Tolmino, at Chiappavano, and at the railway station of Rifemberga (Reifenberg, on the Gorizia-Trieste Railway).

* * *

SEMI-OFFICIAL. ROME, JUNE 1st.—Last night, following a raid carried out by enemy aeroplanes against the rear line of our Army, some of our seaplane squadrons in the Upper Adriatic ascended immediately and bombarded between nine and eleven o'clock the Lloyd and Opeina yards.

Our aeroplanes also attacked a squadron of enemy destroyers, which escaped by making off at great speed along the coast.

All our machines returned to their bases.

* * *

On June 1st enemy aeroplanes coming from the sea flew towards Venice and dropped bombs in the environs of the city. The damage done was insignificant. Three civilians were wounded, including a woman, who was seriously injured. Italian and French seaplanes immediately rose from the Italian bases, and notwithstanding the enemy fire successfully bombed industrial establishments near Trieste, and military points near Parenzo. All the seaplanes returned to their bases.

* * *

A report from the "Times" correspondent at Italian Headquarters, dated May 30th, says:—

On the third night of the struggle between the Carso and the sea, when the weary troops of the Arezzo Brigade had pushed up the lower slopes of Hermada and were hanging on grimly to the positions assigned to them, they were near the end of their tether. For two days they had had nothing to eat but their emergency ration, for many hours they had not drunk, and the sun had been very fierce. They were under very heavy shell fire, and from time to time enemy aeroplanes swept down and raked them with machine-guns.

The operations of the Second and Third Armies have been much aided by the good services of the Italian aviators, who have greatly distinguished themselves in the many duties which now fall to the lot of those whom d'Annunzio describes as "the guardians of our skies."

The duty of attacking the coast line between the Timavo and Trieste appears to have fallen mainly upon British monitors, which have been directly assisted by Italian light craft, aeroplanes and seaplanes. Along all this coast there runs a range of heights averaging some 200 metres, and forming a useful protection to the Austrian main road and to a railway which run to eastward of them. But there are breaks in the hills, notably at Nabresina and at Prosecco, and at these two points the monitors acted with good effect. They appear to have damaged the railway at Nabresina, and to have bombarded Prosecco, causing, no doubt, injury and alarm to the Austrian communications.

DENMARK.

The Esbjerg paper "Esbjergposten" (Copenhagen, May 28th) states that the fishing boat "Energi" on Saturday saved the crew, consisting of two officers, of a wrecked German seaplane in the North Sea. The officers completely destroyed the seaplane before boarding the ship. A few minutes later a Zeppelin arrived and took them off.

BELGIUM.

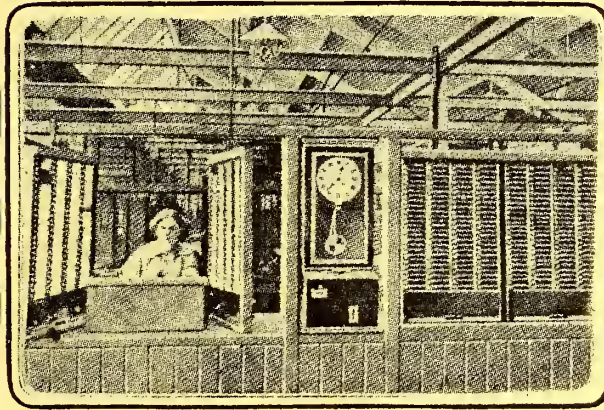
OFFICIAL COMMUNIQUÉ.

JUNE 3rd.—During the night the German artillery bombarded our front north of Dixmude. Our aeroplanes threw bombs on the station of Vysweeve. A shed and a moving train were hit.

SWEDEN.

A message from Malmö to the "National Tidende" on June 1st states that the well-known Swedish aviator, Dr. Thulin, reports that whilst flying over Swedish territory a German flying-machine fired upon him. When near Landskrona he observed two aeroplanes which he thought were Swedish. He thereupon started his own machine and ascended in order to greet them, but when about thirty yards from one of them a machine-gun was pointed at him, and several shots were fired. He was unarmed, and succeeded in escaping without being wounded. Some pilots who witnessed the incident state that the machine was over Swedish territory. Dr. Thulin has reported the matter to the War Department.

It is reported from Malmö that two Zeppelins appeared at 11 a.m. on June 1st over the Baltic off Ystad. The first turned immediately to the south-west, when the torpedo-boat "Pollux" went out. The second came from the east and sailed within the territorial line scarcely two sea miles from the shore. The "Pollux" fired repeatedly at the Zeppelin, which, after some time, went outside the three-mile limit and steered towards the west.



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COMMERCIAL AERONAUTICS.

A Complete Report of Mr. Holt Thomas' Lecture, with his additional Remarks, and the Discussion which followed.

On Wednesday last, May 30th, Mr. G. Holt Thomas delivered his lecture on "Commercial Aeronautics" to the Aeronautical Society, at the Central Hall, Westminster. Lord Cowdray, President of the Air Board, took the chair, and on the platform were Lieut.-General Sir David Henderson, K.C.B., D.S.O., Director-General of Military Aeronautics; Commodore Godfrey Paine, C.B., M.V.O., R.N., Fifth Sea Lord and Director of Air Services; Brigadier-General Brancker, Deputy Director-General of Military Aeronautics; Brigadier-General Pitcher, Technical Director, R.F.C.; Brigadier-General Salmond; Lieut.-Colonel Livingston, R.F.C.; Sir J. D. Rees, M.P.; Major-General Ruck, Chairman of the Aeronautical Society; Mr. Handley Page, and Mr. Barnard Faraday.

Lord Northcliffe was unfortunately unable to be present, and one did not see Lord Sydenham either. The majority of the other members of the Civil Aerial Transport Committee were distributed through the body of the hall. The audience numbered 2,300, which is by far the largest audience ever gathered together to listen to a discourse on aeronautics, and shows that a really intelligent interest is at last being roused among the people of this country.

Practically everyone of note concerned with aviation was present, many members of the Aeronautical Society having travelled from distant parts of the country to hear Mr. Holt Thomas's views on Commercial Aeronautics.

OPENING REMARKS.

The proceedings were opened by MAJOR-GENERAL RUCK, Chairman of the Aeronautical Society, who thanked Lord Cowdray both for taking the chair that evening and for becoming a Member of the Aeronautical Society. He also thanked Mr. Holt Thomas for the labour and skill he had expended in producing this lecture, which he said was a fitting prelude to the first meeting of Lord Northcliffe's Civil Aerial Transport Committee.

General Ruck said that many years ago a few far-sighted men met under the presidency of the late Duke of Argyll and formed the Aeronautical Society for the purpose of studying aerial navigation. One ventures here to suggest that thus there are others than the Highlanders who are now entitled to say "God bless the Duke of Argyll." General Ruck remarked that we are now very near being able to book our passage to New York. As a sign of the times he quoted the case of a member of the Society who last week sent him a cheque for £500 to be expended for the good of the Society. Some time ago the same generous donor, when the Society was in low water, presented it with £100 because he said it was in such a bad way. Curiously enough, he now presented it with £500 because it was doing so well. One would suggest to General Ruck that this is only another example of the doctrine that "To him who hath shall be given."

LORD COWDRAY'S INTRODUCTION.

LORD COWDRAY, in introducing Mr. Holt Thomas, congratulated the Society on being able to fill this great hall with so many who had come in order to hear the latest ideas about flying. Ten years ago Mr. Holt Thomas became an enthusiast on aviation. Eight years ago Mr. Holt Thomas' friend (Paulhan), who was practically his nominee, won the magnificent prize of £10,000 presented by the "Daily Mail" for the Manchester flight. Two years later Mr. Holt Thomas established, largely at his own personal cost, works for the construction of aeroplanes and engines, with the result that when war was declared we had in Mr. Holt Thomas and his enterprise a national asset.

It may be well for one to remind readers of this paper that if the Naval and Military authorities together had accepted Mr. Holt Thomas' offer, made in 1913, to start building Gnome engines in this country if they would guarantee him an order for even as many as fifty engines, Mr. Holt Thomas' enterprise would have been a still greater asset at the beginning of the war.

MR. HOLT THOMAS' FOREWORD.

MR. HOLT THOMAS remarked that Lord Cowdray had really been too complimentary to him. It was in fact journalism which had brought him into aviation, owing to the interest he took in the "Daily Mail's" offer of a £10,000 prize for the London-Manchester flight. The lecture as printed hereafter is as published by the Aeronautical Society.

Mr. Holt Thomas departed slightly from the actual wording of the lecture in reading it, and added some interesting points which have been interpolated. He also left out one or two of the points which appear in the printed version, as it was necessary for him to cut down the length of his lecture in order to allow time for subsequent speakers, but readers now have the benefit of receiving both versions, as follows:—

THE LECTURE.

MR. HOLT THOMAS said:—

The subject I have to deal with in this paper is enormous, and of vital importance to the Empire, but it is only possible to touch very lightly on the possibilities of commercial aeronautics in the time allowed this evening. My opinion is that it will revolutionise the world not only from a commercial point of view, but from a humanitarian point, much more indeed than it has revolutionised warfare, although the effect on that is very great.

Civil, as opposed to military, aviation in pre-war days has simply meant civilian pilots acting professionally or for sporting purposes, but civil aviation after the war will certainly be of quite a different character and with objects of very much greater importance. I am not one of those who think that commercial aeronautics are going to beat railways and other forms of transport out of existence, but rather that flying will act as an adjunct to the present modes of transport.

The question which we have to decide to-night is: "Can the aeroplane, taking into account the advantages of speed, etc., which it alone possesses, be regarded as a practical means of transport?"

I wish to make it quite clear that I in no way intend to deal with the *type* of aircraft to be used for commercial purposes, but simply to deal with these uses as I foresee them in the near future.

Again, I am only, for commercial purposes, going to talk about aeroplanes. The lighter-than-air machines have their uses, but the cost is, I think, too great to bring them in for commercial purposes, at any rate at the moment (although I speak as one interested in airships as well as aeroplanes), and their speed is not sufficient. It is, however, certain that we must be first in airships, as in everything else, in this country, and airship services subsidised by the Government to a very large extent will undoubtedly be the course so far as lighter-than-air machines are concerned.

A great compliment has been paid to the Aeronautical Society and myself this evening, inasmuch as we have as Chairman Lord Cowdray, the President of the Air Board, and, personally, I am quite as pleased to have him as my Chairman in his unofficial position, namely, as one of the most eminent business men of this country for this reason.

The successful use of aircraft for commercial purposes will depend on the views of business men, and no one is more capable than our Chairman to-night to decide whether there is a commercial use for aircraft or not, whether aerial services will constitute a financial success or not, and generally to decide whether I am talking common sense to you this evening, or whether I am to be regarded, as I have been for so long, as simply an enthusiast.

In my opinion there exists no doubt at all on the matter, no more doubt than has been the case for the use of aircraft for military purposes, now proved up to the hilt; and as I was a true prophet on military uses, I would ask you to have some confidence in my statement as to commercial uses.

A LAMENTABLE HISTORY.

The history of aviation in this country is lamentable, but glorious. No country has had the practical results of flying put under its very nose more than Great Britain. The first great meeting after Reims was held at Blackpool. In 1909 I brought Paulhan to London. In 1910 the first great town-to-town flight in the world, London—Manchester, for which a prize of £10,000 was given by the "Daily Mail," took place, and nothing in my very full life gave me greater pleasure than organising it. The Circuit of Britain, which covered 1,000 miles round our own country, was an event which ought to have convinced anyone. The aviators in the Circuit of Europe, in which I acted for this country, after passing through France, Holland and Belgium, arrived in London. There were a million people to see them leave Paris, but at Hendon they were met by more police than public.

The first flight on Salisbury Plain, which I arranged with the late Captain Dickson, at the Military Manœuvres in 1910, would have convinced anyone but a Britisher. But luckily, as Britishers always do, we got there in the end.

Now this is all ancient history, but why I refer to it is because our want of initiative was due to public apathy, and apathy on the part of business men. No country depends more on public opinion than our own. It can carry anything, and our dilatory methods in military aviation are entirely due to public apathy. If we show the same apathy towards Commercial Aeronautics as we showed towards Military Aeronautics we shall be left behind when Peace comes.

The fact that a handful of machines crossed the Channel on the outbreak of war is not due to the Flying Corps. No keener body



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of men existed, but up to the outbreak of war they were starved. It is a wonder their enthusiasm was not entirely quenched. It was not due entirely to the War Office or the Cabinet, who, I again affirm, could do very little without public opinion behind them. The glorious record of the Flying Corps, notwithstanding their infinitesimal beginning, is now known to us all. The importance of military aeronautics is now known to us all, but nobody can say how we might have changed this war if we had taken it in time.

To-night I am speaking in exactly the same strain on *commercial* aeronautics as I spoke seven years ago on *military* aeronautics, and I assert without the slightest fear that I am speaking on as large a subject, and one of just as vital importance to the Empire. But we must not let history recur. We *must* be first. No one will be quicker than the Huns to recognise the importance of this, the latest form of transport, but *this time we must be the leaders*. As British military aviation has shown, we have the men, second to none; we have the designs, and I am addressing you to-night to ask you to give the public support, the energy, the finance, and the encouragement which must be behind a movement of the kind if it is to succeed. It is a world-movement, and we *must* lead.

CIVIL AERIAL TRANSPORT.

Another point is the fact that Lord Cowdray has recently appointed a Committee, with Lord Northcliffe, who has always taken such a keen interest in the subject, as Chairman, to advise on the uses and development of commercial aircraft. This Committee should be one of enormous importance, as although I shall touch to-night on a few evident uses of aviation for commercial purposes, frankly I think they are illimitable. The aeroplane is mobile. It can move from one route to another at will, and always at enormous speed compared with other forms of transit. It is going to open up the world as no other means of transport has yet done, and I look to Lord Northcliffe, whose enterprise and energy we know, to so guide his Committee that a start, at any rate, will be made quickly and on the right lines.

Only a few days ago General Smuts said in a speech:—"Our Empire, peculiarly situated, scattered over the whole world, was dependent for its very existence on world-wide communications which must be maintained, or that Empire would go to pieces." General Smuts was not thinking of aviation when he said that, but his words are of great importance to this subject.

AIRCRAFT TAXATION.

In reading a paper on "The Commercial Use of Aircraft in the Future," I am placed in a somewhat awkward position, as I have spent a good many hours explaining to the gentleman at the Ministry of Munitions who is responsible for the taxation of aircraft accounts that there is no future whatever for aircraft after the war as a source of taxation; and this evening I am here, at the request of the Aeronautical Society, to prove exactly the opposite. But unless the Aircraft Industry is left with money after the war it cannot make a success of Commercial Aeronautics.

The position, however, is not so awkward as it might appear, as this paper is largely an effort of imagination, and the ideas which I have to put before you would be quite impossible to carry out unless the accounts of the aircraft companies are very liberally treated as regards their so-called profits during the war and as regards subsidies for aerial services after the war.

I say "so-called profits" as the capital expenditure since the war in the case of aircraft companies has been so huge, and of such an extraordinary nature, and their pre-war standard is so absurd compared with other industries that taxation can with the greatest ease entirely prevent any schemes for the use of aircraft after the war by leaving no funds for development.

GOVERNMENT SUBSIDIES.

To carry out commercial schemes very large expenditure will be required, and this is naturally impossible unless there are funds to draw on. For commercial aircraft new types of machines will have to be devised and new problems will have to be faced.

But there is another problem for the Government in addition, namely, the question of Government subsidies for mail and passenger services.

The British Mercantile Marine has been assisted in the past by subsidy, and I fail to see why the British Commercial Air Services should not come under the same category. We know during the war how important the Mercantile Marine has been, and the Commercial Air Services, if they had been in existence and properly developed, would have been equally important, and certainly will be in the future. You can decide what we could do to-day if we had a real surplus of aircraft and pilots as well as I can. You can decide what effect on the war at the beginning we could have had with a large aerial fleet, under an Air Board, with, say, Lord Cowdray as President.

Aviation has suffered in the past from much discouragement, and the people in this country must see that in the future not only is it not discouraged, but on the contrary that it is very fully encouraged. One way of encouragement is a subsidy for passenger and mail services, and although I cannot say exactly

how this could be done, I think I may safely say that all that is asked for is encouragement on business lines in the form of money paid for services rendered.

THE DOUBTERS.

But there are many doubters even in the aircraft world. Fog is mentioned, weather is referred to, and many objections raised. Several friends have said we cannot compete with trains and lorries and other forms of transport, and that we cannot carry heavy weights. One man said we could not transport a motor-car, for instance, and so on.

Now all these doubters, even if they were right, in my opinion have not altered the case one jot. They have simply done what the Army Council did when, years ago, I used to attack them daily—they have simply advanced arguments as to what aircraft will *not* do, ignoring what it *will* do. One might as well say nowadays a motor-car is no use for commercial purposes because it cannot fly. At the same time I may say that, if anyone wants it, it is perfectly easy to produce an aeroplane which will transport a motor-car with ease, and several machines are in existence to-day which will do it, so far as weight is concerned.

Fog, for instance, is a drawback, but it holds up trains, motor-cars, and ships. If bad enough, it stops the whole of the street traffic of this Metropolis, and personally in this new science of flying and new method of transport I would far rather accept the argument that we shall have, sooner or later, fog-penetrating searchlights on our machines, or other devices, than that fog will prevent the use of commercial aircraft.

Because we *can't* do what a train or motor-car can is no argument whatever in my opinion. The whole and only point in my case for commercial aircraft is that we *can go faster* and within certain limits carry a given weight faster than any other form of transport.

COMMERCIAL USES.

The question naturally arises as to in what way will aircraft be used commercially after the war. As I have said for nearly ten years, to prophesy for such a new science as flying is almost impossible, but many instances will crop up for the use of commercial aeroplanes, of which I may give you a few.

Surveying, for instance.—I am told by my friends amongst the large contractors that it would be worth an enormous sum to be in a position not to know where to go, but to know where *not* to go; and the production of some sort of cinematograph machine for the purpose has already been tried and certainly will be produced.

For those in a hurry, nothing can compete with the aeroplane for those on special services in need of the greatest speed possible. This alone opens a very wide field indeed.

From a business point of view it must be remembered that speed is everything. One saw this in pre-war days in the competition between the Steamship Companies in the race across the Atlantic. A special aeroplane, i.e., special used in the sense of special train, which is perfectly feasible to-day, will enable the business man to leave London in the morning, do his business in Paris, and be home again to dinner. It will take him to Bagdad in a day and a half or New York in two days.

Many business men would smile at the idea of using this mode of conveyance to-day, but the only thing is to remind them that they also smiled in the early days of motor-cars, and yet half the business to-day would take double the time to do if the motor-car were not in existence.

SPORT.

Aeroplane racing should also be considered. I have read a remark by the Editor of THE AEROPLANE to the effect that an officer can fly in races and remain an officer and gentleman just as much as if he rode in the "Grand Military."

SPECIAL OPENINGS.

Then again many special openings will occur, and I will give you one which I discussed before the war with the Editor of the "Daily Mirror," namely, as to whether we should not keep a machine and pilot always at their disposal, in order that in the case of any such event as a big railway accident or any event of great public interest their representative should be on the spot as soon as possible, and, of course, ahead of any other paper.

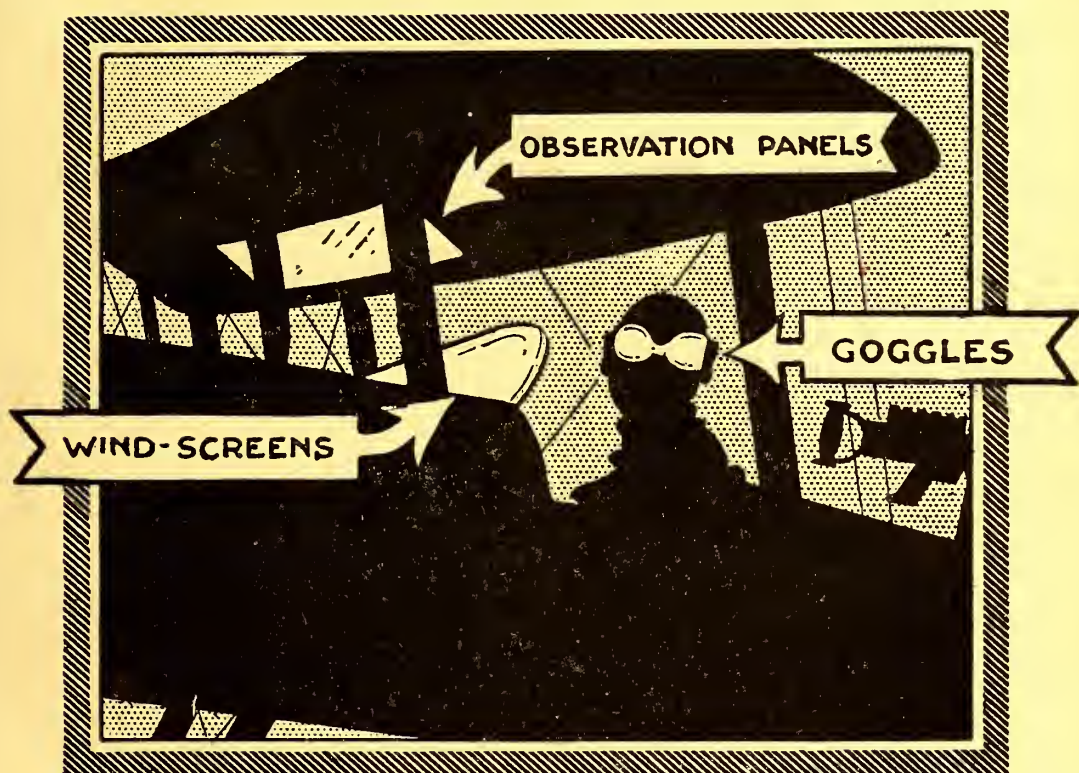
A parson in a far-off Colony has already proposed to use a seaplane to fly round the coast, across bays, etc., and so visit his parish in hours instead of months of tedious travel.

RIVER TRAFFIC.

Rivers again suggest a very probable and certainly useful employment of aeronautics, using them as a line of flight. Huge districts in many localities, such as Africa, are controlled by officials who usually employ the river as a means of transit, using motor launches, and then inland from the nearest point. Think of replacing this by the use of seaplanes doing 100 miles an hour. This equally applies to mails. South America, Canada, Asia, all come into this scheme, and no landing ground is required. Nature has supplied it in the form of a smooth-surfaced river. Again, these ready-made roads could be followed at night

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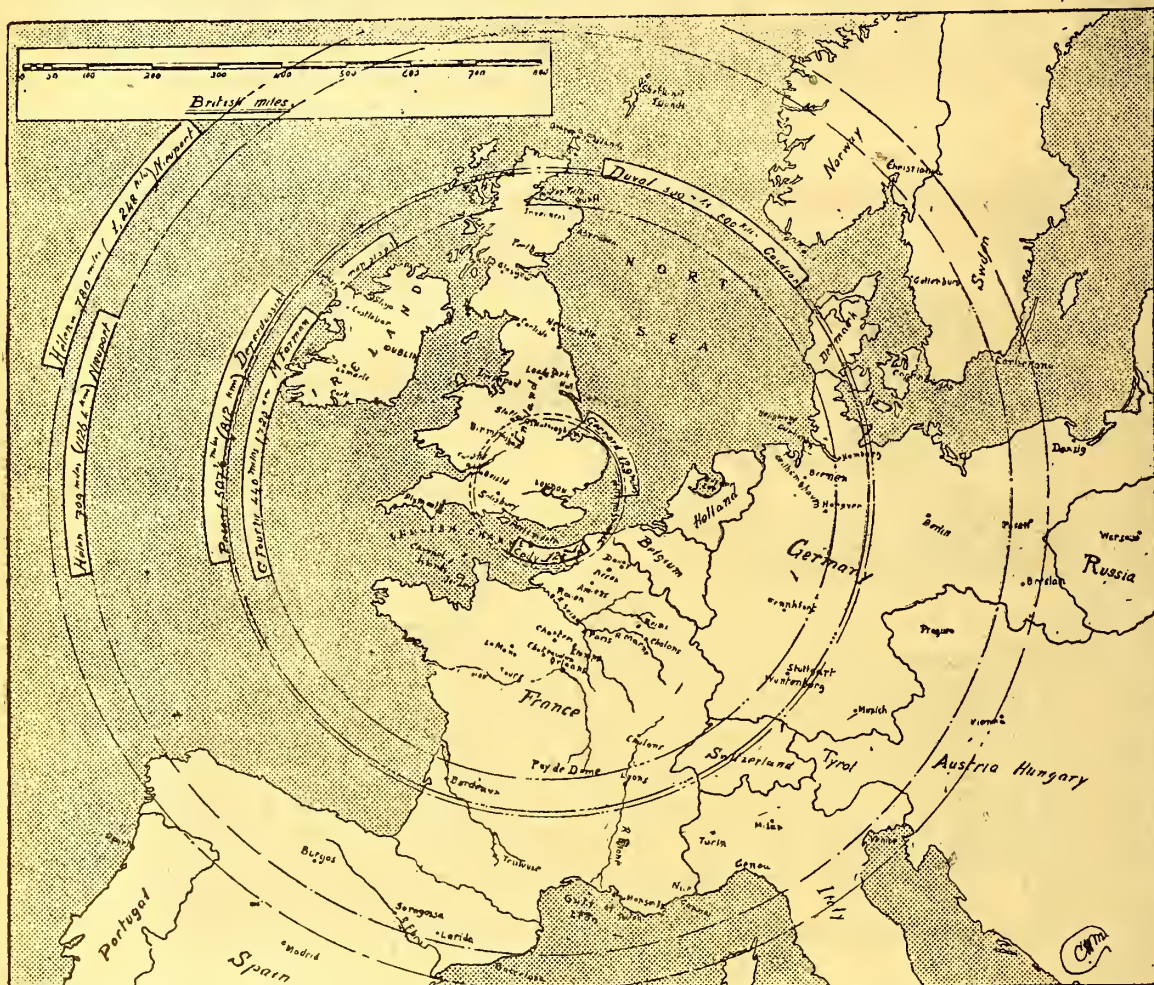
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AS A NEWSPAPER.

THURSDAY, SEPTEMBER 14th, 1911.

No. 15

What It Really Means.



The big flights of 1911, up to date, are shown above, as if the aviators had started from London and had flown in a straight line in any given direction, leaving wind out of consideration. The accompanying table gives further particulars:—

Hélie	780 miles (1,248 kms.)	14 hrs. 7 m.	...	(International Michelin)	Sept. 9th	...	Nieuport Monoplane.		
Hélie	709 " (1,126 ")	13 " 47 " 19 s.	...	(" ")	Aug. 26th	...	Nieuport	"	
Pascal	507 " (812 ")	12 " (about)	...	(" ")	Aug. 29th	...	Deperdussin	"	
Duval	500 " (800 ")	12 " (about)	...	(" ")	Aug. 29th	...	Caudron Biplane.		
Fourny	440 " (720 ")	11 " "	...	(Non-stop Record)	Sept. 1st	...	M. Farman Biplane.		
Gerrard	129 " "	4 " 15 m.	...	(Mortimer Singer)	Aug. 16th	...	Short Biplane.		
Cody	125 " "	2 " "	...	(British Michelin)	Sept. 11th	...	Cody Biplane.		

[The picture above appeared in THE AEROPLANE of September 14th, 1911, by way of impressing on the public the possibilities of journeys by aeroplane even at that period. It will be news to many aviators of to-day that such flights had actually been made nearly six years ago.—Ed.]

with a searchlight on the machine with the greatest ease and no danger.

The Cape to Cairo Railway again affords simply an instance which occurs over and over again in that and other countries, where an aerial service might be employed as an adjunct to the railway. The present method would probably be one's arrival at a wayside station and then, say, 50 miles in a bullock wagon, or perhaps walking, over jolty roads, or no roads at all, taking one several days. Compare this with stepping into an aeroplane and arriving in half an hour. Certainly the development of all the Overseas Dominions will be largely affected by flying. The war has already shown what flying on the Cape to Cairo Route would be like, as demonstrated by the South African Flying Corps in East Africa.

PASSENGER AND GOODS TRAFFIC.

In this paper, however, I propose to deal with what I am sure most of you have in your minds, although there are certainly other uses, namely, the conveyance of passengers, mails, and goods to all parts of the world at a speed beyond anything yet attempted.

Now I might be asked why I have confidence in such a means

of conveyance and in its success as a commercial proposition. The reasons are these:—

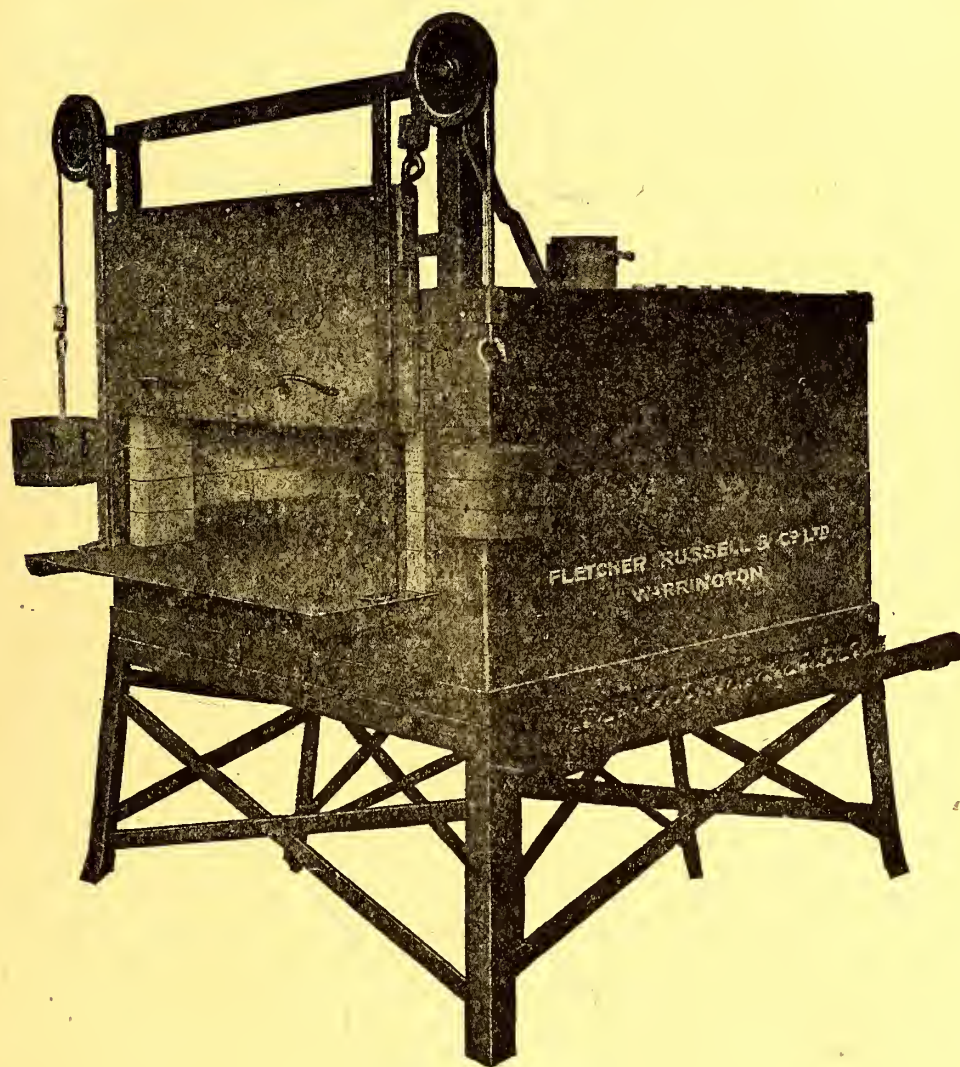
Firstly, that it is faster than any other means of transport. Secondly, that I consider it safe.

Thirdly, that it is not too costly to provide a commercial proposition.

The first claim which I make for the use of aircraft after the war is the fact that it is the fastest form of transport in the world. We have to-day practical machines which will do well over 100 miles an hour, indeed, far higher speeds, and by practical machines I mean a machine which has high speed, low landing speed, and weight-carrying capacity, going from point to point as the crow flies, and no other mode of transit can do this. And I think our Chairman will agree with me when I say that any means of transport which can undoubtedly claim to be faster than any existing means must have a commercial future, unless it is so dangerous that it cannot be used or it costs so much that it is outside practical politics, which I will come to later.

The accompanying illustration from THE AEROPLANE of Sept., 1911, will show what distances had already been covered in the day even at that early date.

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Now as to being the fastest mode of transport, I will show you a map of Europe, with the distance to certain well-known cities defined, and compare them with the fastest times known by pre-war routes compared with reaching them by aeroplane, and you cannot but agree that whatever the disadvantages an aeroplane has, or, more properly, you *think* it has, it outdistances with the greatest facility any other mode of transport.

If you will look at the map of Europe presented, you will see that Paris is brought within three hours of London instead of seven, that Rome means $12\frac{1}{2}$ hours instead of 42 hours, and that Petrograd and Constantinople are both brought within a day's journey, and other instances of fast travelling. This map should be sufficient evidence, I think, to fully prove my contention that the aeroplane outdistances any other mode of transport with the greatest ease. The figures I am showing you are not guesswork and are not exaggerated, as the speed at which I have taken the machines is a speed easily attained to-day, viz., 80 miles per hour, and will certainly be increased in the future. The safe arrivals of these long-distance flights will depend largely on the question of landing grounds, to which I will come later.

SAFETY.

Now as to the second point, safety.

Flying, even from the first, has never been really dangerous, although it had been thought so in the minds of the public.

We are in a position to-day to decide this—at least, those who are in close touch with flying. One takes risks in many ways, but the question as to whether these risks constitute a danger concerns the percentage of accidents. One takes risks, for instance, in using a lift, and the question as to whether a lift is dangerous or not is merely one of how many people are injured or killed in using lifts. We are presumably taking risks this evening from Zeppelin raids. One takes risks in crossing the street, and in every case a decision as to whether a thing is dangerous or not is one of statistics. In flying, if statistics were taken, for instance, of the number of miles flown per accident, of the number of accidents at any aerodrome per annum, and so on, it would be found that although it is evident one is taking risks in the air, these risks do not constitute a danger.

For instance, we all know that the Hendon Aerodrome has been established since 1910, and we know the number of accidents that have taken place there. This certainly would not constitute flying at Hendon as a danger, but even then from these risks of flying one must deduct such points, for instance, as dangerous machines, of which there were many in the early days; one must deduct the acrobacies which many pilots perform; but even without those deductions, most people in this room know that the odds against an accident in getting into a machine and flying anywhere you like are very large. To-day most flying is war flying, with war risks. It must, again, be remembered that flying is very young, and if one puts it on the same plane as motoring in the early days, motoring would be criticised as highly dangerous. Much of the flying in pre-war days has been in competition, and one can recollect the enormous number of fatal accidents in the early motor-car races.

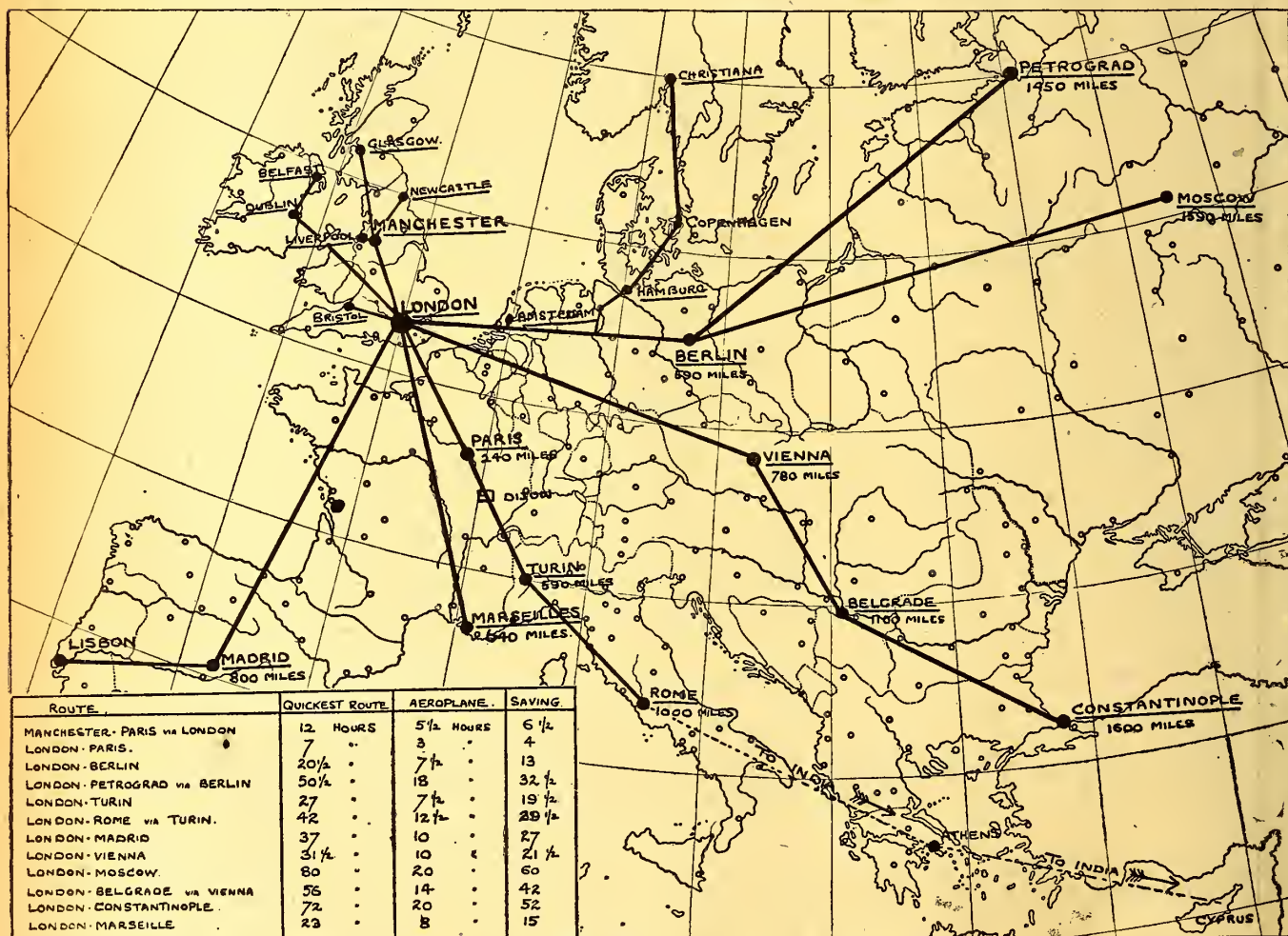
It is, of course, difficult to obtain exact statistics of the number of miles flown, etc., but I think I may be regarded as possessing a fairly long practical experience of flying and more or less common sense, and, frankly, I should never have flown if I had thought for one moment that I was going to be killed. I have always regarded it as very long odds that I should *not*, and even in those days the risks taken were considerably more than they are to-day.

I am dilating a good deal on safety, as I think it would be a very small future for aircraft after the war if it were looked on as highly dangerous, and the public must be instructed by practical demonstration (which means aerial services which run day after day) that flying is a good deal more practical than it looks. On this point of safety, also, the question of landing grounds is of immense importance, and I will show you later on why this is so.

COSTS OF FLYING.

And now for the third point, viz., the cost of running an aerial service. I think it would astonish a great many people if I could prove that the running costs of an aeroplane are not more than those of a motor car, and I am going to quote from a chapter in a book entitled "Flying," by Hamel and Turner, to which I contributed several years ago. Four types were given, and the running costs in the air were as follows:—

(Continued on page 1468).



Aerial Routes Across Europe.—It may be noted that although direct routes run across Germany and Austria, it is equally easy to run air-lines across Allied Territory, whereas Germany cannot go anywhere, except to Scandinavia, without crossing the territory of the Allies.

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The British Aircraft Industry.

BY CHARLES L. FREESTON.

XIX.—MANN, EGERTON AND CO., LTD.

In the way of rising to the occasion under the stress of war-time emergencies, no firm has a more honourable record than that of Mann, Egerton and Co., Ltd., of London and Norwich, for in entering the aircraft industry they achieved what must certainly be regarded as an extraordinary *tour de force*.

Already, in THE AEROPLANE of May 16th last, I have referred to the successful way in which many firms who, before the war, perhaps did not know one end of an aeroplane from another, were nevertheless able to change their normal business and take up the manufacture of aircraft to specified designs. A FACTORY IN NINE WEEKS.

But at least they had factories as going concerns, and factory organisation is a thing that has to be learned on its own account, whatever the products of the applied brains and labour.

Messrs. Mann, Egerton and Co., on the contrary, had no factory, as such; although, of course, they had their Norwich premises, affording some 100,000 sq. ft. of

floor space. This circumstance was not, however, allowed to act as a deterrent, and they rapidly constructed two additional factories, one of which they ran up in nine weeks!

And what is even more to the point, they have produced therefrom both seaplanes and land 'planes, not simply of standardised types beloved by the Government, but machines of up-to-date design, and capable of holding their own with the best.

No one, however, who knows Mr. G. N. C. Mann, the managing director of the company, will have been surprised at the success of this remarkable achievement. Let it be said at once, nevertheless, that Mr. Mann makes no claim whatever to having dominated the aircraft side of the firm's business, nor need any word be written which might be construed into a reflection upon the untiring energies and capabilities of Mr. George L. Wilford. but it is hardly possible to doubt that the fact of having so good a man of business as Mr. Mann at the head of affairs must inevitably have been all to the advantage of the new undertaking.

MANY-SIDED ACTIVITIES

Originally an electrical engineer, Mr. Mann bought an electrical business in Norwich in 1898, and established a motor-car

agency the year following. Successively he launched out with an electrical department at Ipswich, another motor-car agency at Bury St. Edmunds, a large depot in London, and then a further motor-car agency in Ipswich.

It may be mentioned in passing that the electrical side of Messrs. Mann, Egerton and Co.'s activities has attained important proportions, and contracts for electric lighting and power equipment, running into several hundred thousand pounds, have been carried out since the commencement of the war for the Admiralty, War Office, and numerous controlled establishments in all parts of the British Isles.

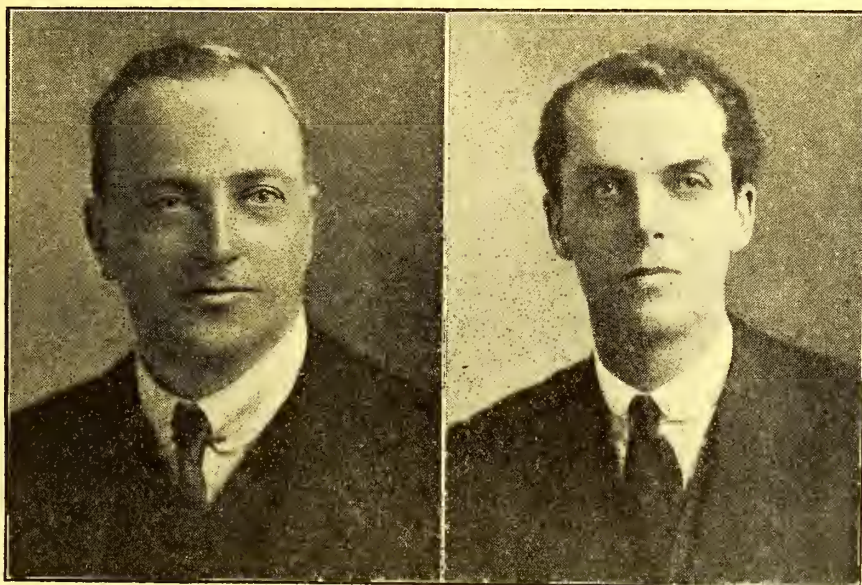
More recently, with characteristic enterprise, a new departure has been made in the operation, under the scheme of the Board of Agriculture, of scores of agricultural tractors in the counties of Norfolk and Suffolk.

EXTRAORDINARY CELERITY.

When the country's needs indicated an urgent demand for increased aircraft production, Messrs. Mann, Egerton and Co. had in their existing Norwich premises a ferro-concrete building which contained over 100,000 square feet of floor space, and was both lofty and well lighted. Here was the nucleus, at all events, of an aircraft factory, while two additional factories were put in hand to provide the necessary trimming, doping and erecting shops. It was the last-named shop that was put up in the record time of nine weeks, although it is 200 ft. long by 100 ft. wide and 25 ft. high, all clear space without a pillar.

In order to render the organisation self-contained, moreover, some sixty acres of land were purchased in the Aylsham Road, within easy distance of the original premises, and laid down as an aerodrome. Heaps of trees were removed, and pits and depressions filled in, with extraordinary celerity. The object of the aerodrome, of course, was to provide for acceptance trials, experimental work, instruction, etc.

The trained engineers, coach-building craftsmen, panel beaters, trimmers, and painters on the staff provided an excellent basis upon which to begin the work of aircraft manufacture, and paved the way for the high reputation which was soon attained by the firm for high quality of workmanship.



Mr. G. N. C. Mann.

Mr. G. L. Wilford.

For the initiation, organisation, and operation of the aircraft manufacturing department the responsibility was vested in the hands of Mr. George L. Wilford, the general manager and a director of the company. With the aid of his ten years' all-round experience with Midland manufacturing firms and his exceptional personal ability, he was able to secure results in the way of rapid development which were little short of marvellous.

AN ABLE STAFF.

Mr. Wilford was also fortunate in securing the services of Mr. J. W. Carr, A.F.Ae.S., C.E. (Har., U.S.A.), as technical expert and chief designer. Mr. Carr's aircraft career dates back to 1911, when he joined the Deperdussin Company in Paris, eventually becoming assistant engineer, and obtaining considerable experience in designing, building, and experimenting with monoplanes, in association with such well-known pilots as Provost, Vedrines, Garros and others.

When the Deperdussin Co. began operations in England, namely, at Brooklands, Mr. Carr was transferred as assistant to Mr. F. S. Koolhoven, and the work he performed for the company contributed largely to its success in the military trials of 1912.

In 1914 Mr. Carr joined the Perry-Beadle Co., and was responsible for designing a 45-h.p. Anzani single-seater tractor-biplane, which was flown by Mr. Dukinfield Jones, and was pronounced in *THE AEROPLANE* of October 21st, 1914, as probably the most efficient tractor biplane of its power produced at that date. Thenceforward, until he joined Mann, Egerton and Co., Ltd., he was at work on the design and production of helicopter and other machines.

On the engineering side, the firm was fortunate in having as works' manager Mr. A. B. Drummond, who had had a considerable experience of manufacturing in various branches, whilst the wood-working section was placed in the able hands of Mr. Arthur Gibbs.

In addition to Mr. Mann and Mr. Wilford, the directorate includes Mr. F. W. Doggett and Mr. G. Redgment, who are both well known in motor-car and electrical circles.

ON KEEPING MINIMUM STOCKS.

By GEORGE H. MANSFIELD.

(Managing Director—The Aircraft Supplies Co., Ltd.)

[In a recent issue of "Aircraft Supplies," Mr. Mansfield dealt with the question of urging deliveries of orders placed out, but on further consideration it seems possible, in fact, it is possible, by instituting a system of keeping a minimum stock store to avoid a lot of work in connection with urging these orders; that is, for small parts such as A.G.S. parts or bolts, nuts, washers, etc.

The following notes by Mr. Mansfield are worthy of study.—Ed.]

To keep a minimum stock store of other parts, wood or metal fittings, would be superfluous in these days, but for small fittings and parts it is an excellent principle. Certain large firms in this country have already adopted this method, and, in fact, the buyers generally secure several of such items whenever they find them *Ex Stock*, whether the M.S. is below the "called for" minimum or not.

There need be no fear that this store might at any time contain stocks of obsolete parts to any serious cost value, because although certain items in such stocks may be obsolete for the contracts in the hands of the particular manufacturer, there should not be any difficulty of disposing of the parts to another manufacturer.

In the past two years of war, or we might even say during the past few months, how extremely helpful it would have been for a contractor, held up for just those "two or three" things he wants to complete his first 12 machines, to have been able to go to his minimum stock store and get them; in many cases the goods have been obtained from the factoring houses in London, but for one reason and another these said depots of supply have not been able to supply every such urgent requirement—it has hardly been possible for them to do it—since, if they were to be regarded as a regular minimum stock store, they would become part of a colossal undertaking.

A firm may require, say, 62 tie rods complete, each measuring no more, or less, than 3 ft. 6.7 ins. long; these rods, as at present made, will, because of the exact length, only be useful for a special part, and, consequently, a minimum stock is hardly possible, although the nuts, ends, and pins will form a part of the M.S. stores.

If these minimum stock stores had been raised in most large works some time ago, it is quite certain that, not only would some delays have been avoided, but the prices of items would have been kept down instead of being allowed to increase through the urgent demands made, and extra time and labour having to be employed in rushing quantities through; apart from which, firms would have been able to concentrate on fixed parts and run on for a considerable time without changing to other parts owing to orders running out. If there had been these minimum stock stores the demand would have been huge,

RAPID PRODUCTION.

As the work which has been done by the company has been exclusively for the Admiralty and War Department, it is impossible to describe it here in detail, but at least it may be mentioned that the firm probably holds a record for the variety of types of machines produced in a definite period, including seaplanes and aeroplanes, ranging in size from 86 ft. span to 26 ft.

Extraordinary results have also been attained in respect of rapidity of production. In one case, in particular, a new machine of the latest continental type was built, chiefly from a sample machine, and completed in five weeks and two days from the time of starting work.

EXPERIMENTAL WORK.

In addition to the foregoing, the ability and experience of Mr. Carr and his colleagues has been officially recognised by the placing of orders for the production of several machines of experimental type, of which details, for obvious reasons, cannot be disclosed.

It may be added, too, that besides the aircraft manufacturing side of the business, and apart from the ordinary motor engineering work, there are three separate and distinct departments of the company all fully concentrated on Government work. One of these, which is now centred at the London premises, is engaged on the production of aircraft accessories, and from an inspection of the work in operation and the careful testing methods employed, I may say that it leaves nothing to be desired in the way of efficiency and excellence.

Notwithstanding all the Government work above referred to, involving the employment of a number of workpeople running into four figures, no fewer than eight directors and over two hundred of the original employees of the company are on active service.

Finally, it should be mentioned that, having made so eminently successful an entrée into the aircraft world, Messrs. Mann, Egerton and Co., Ltd., have no intention of regarding the new sphere as a matter of war-time emergency alone, but will remain an important factor in the industry after peace has been declared.

perhaps greater than it really has been, and to-day certain nuts might not have cost 7s. 6d. per gross, provided also that the "slotters" were only available. It was possible at one time on a large order to get certain plain A.G.S. nuts as low as 2s. 1d. per gross, but later the price was not lower than 3s. 6d., while to-day 7s. 6d. is charged by many makers; and again with slotted nuts.

We are convinced that if every manufacturer will *at once* start a minimum stock store of small parts, they will not only stop the increase in price, but will find that they have something to fall back on when the rushes come along. It can hardly be hoped that prices can decrease now, especially in view of the recent wages award, so we hope that in many works instructions will be issued for M.S. stores to be kept. It must, of course, be admitted that unless a standard is worked to for these parts, i.e., A.G.S. parts, it becomes very difficult; but is not every manufacturer adopting the A.G.S. standard now?

If one takes a list of A.G.S. parts* (a), every buyer will recognise quickly just those parts which the stores are always wanting in quantities—bolts, nuts, washers, fork-ends, split pins, turnbuckles, strainers, etc., etc., and if they go through it carefully and draw up a list† (b) of their M.S. and get the stores to stick to it, many a trouble or rather delay in delivery may be avoided.

It may be useful here to recall the cards which were dealt with in a recent issue of "Aircraft Supplies"; the first form, which can certainly be used as a card, will show at a glance at any time not the actual stock in stock, but the stock *on order* of any particular A.G.S. part, while the smaller card contains a record of the full particulars of each order.

There are numerous instances of A.G.S. parts, which we could mention, as often holding up contracts, but a few minutes' consideration on this subject will show that it is not difficult, given the time, to buy in stocks of these parts and even such as pins (A.G.S. 137), or the new ones (A.G.S. 1137, A. B. C. and D.), if sources of supply are noted every time. Neither can we nor the most noted manufacturers suddenly turn our machines and labour on to making varied quantities of these parts, but stocks can be supplied and gathered together by careful ordering and securing of stocks whenever they come to one's notice.

We hope that many buyers and storekeepers will agree that this method of laying in minimum stocks must assist towards relieving the shortages of parts from time to time, as revealed by the shop stores and erecting shops. We are pleased at all times to assist any buyers who care to write us on this subject, and, as many of them know, if we cannot supply their requirements ourselves we have no hesitation in saying where we think they may obtain them.

* (a) See the A.G.S. book, published by the Aircraft Supplies Co., Ltd.

† (b) We are always pleased to supply a suggested list of A.G.S. minimum stock.

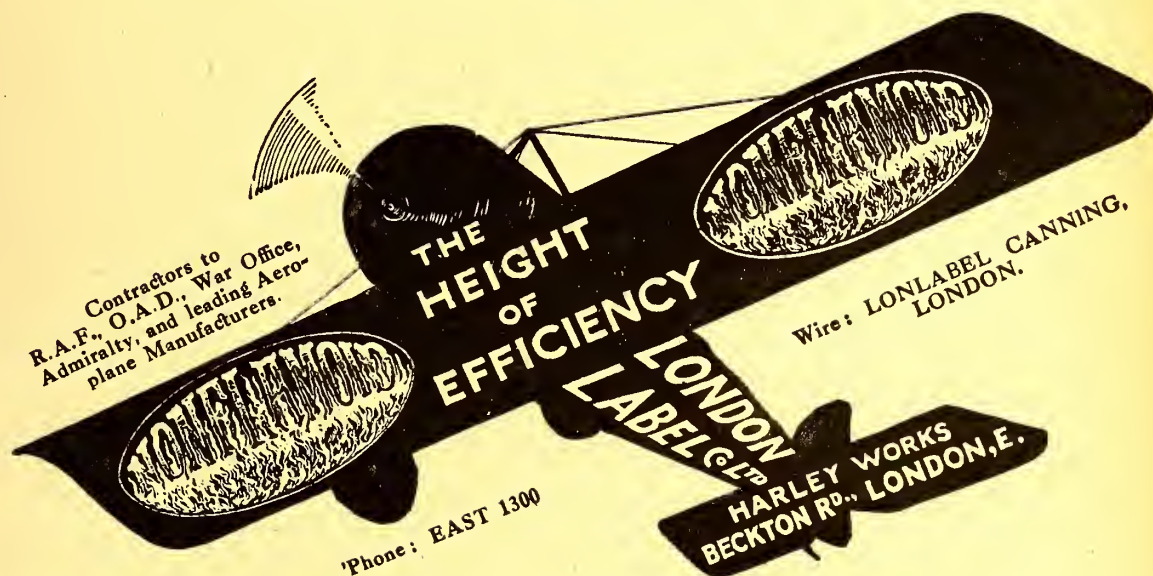
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The Construction of Aeroplane Propellers.

BY FRANK W. CALDWELL.

(Reproduced from "Aviation," New York, May 1st, 1917.)

There are a large number of woods used in the construction of aeroplane propellers and the selection of one suitable to meet the conditions in hand is not always an easy problem.

The woods most commonly used in American practice are: birch, Honduras mahogany and white oak. Other woods that are sometimes employed are: maple, spruce, poplar, ash, and gum.

It is easily marred, however, and is only moderately strong. Quarter-sawn white oak has given about the best results for from 60 to 100 h.p. engines. It has a very high tensile strength, and a high compression strength across the grain and is not very much affected by climatic changes. Only absolutely dry stock should be used, otherwise trouble with the glue joints will be encountered. The material must be quarter-sawn or layed out to give an edge grain

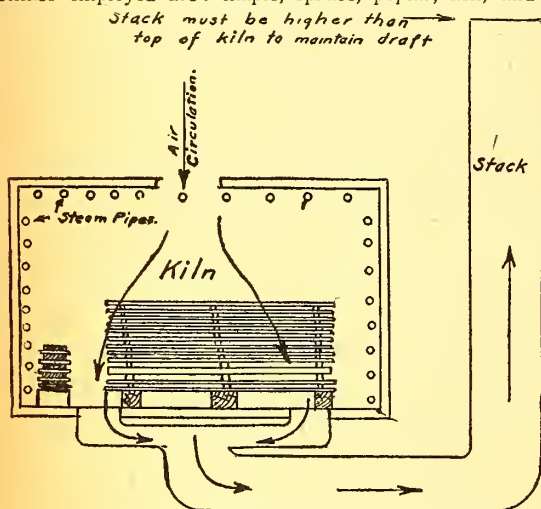


FIG. 1.—Sketch showing circulation of air through dry kiln. Note that the boards are separated by small sticks to give a more even circulation of air.

In England Honduras mahogany and black walnut are most widely used and the preference seems to be for the black walnut. Spruce is used to some extent for the smaller engines.

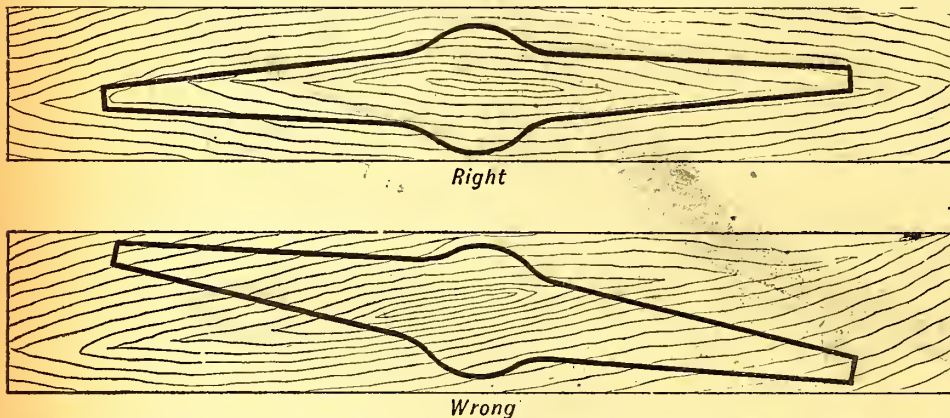


FIG. 3.—Showing the way in which the patterns should be marked out.

For engines up to about 50 h.p. spruce is a most satisfactory wood, as it is light, strong, easy to glue, and is not excessively affected by changes in climatic conditions.

For engines of from 60 to 100 h.p. alternate laminations of maple and spruce have been used in a great many cases. The arrangement is always made so that the maple boards come on the outside in order that the harder wood may come in contact with the metal hub plate and prevent the plates from sinking into the wood. This arrangement is not recommended, however, as the woods have a different coefficient of expansion (not to be confused with the thermal coefficient of expansion) with changes in humidity. This causes warping and season checks which usually show up in the spruce as it is the weaker wood.

Honduras mahogany has been used for these engines and has given very good results as it is very easy to glue, is comparatively light, and is very little affected by climatic changes.

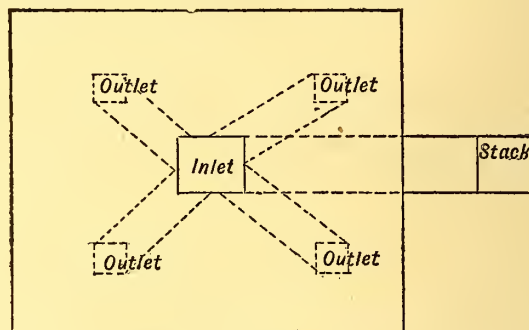


FIG. 2.—Plan arrangement of kiln.

as the plain oak has a very decided tendency to develop season checks. The use of edge grain will be explained later.

WOOD FOR LARGE HORSE-POWERED ENGINES.

For the very large engines of about 200 h.p. it is rather hard to say which wood has given the best results. In order to keep down the weight the hub flanges are usually made as small as possible and this makes it necessary to have a very high bearing pressure on the hub plates so that the friction between them and the wood may be great enough to drive the propeller. This makes it necessary to use wood with a high compressive strength across the grain in order to prevent the hub plates from sinking into the wood. Birch shows more resistance to this

than any other wood with the possible exception of maple. Birch is also very tough, has a high tensile strength, and is not prohibitively heavy. It is very hard to glue, however, and must be dried very carefully to get good results. It is very much affected by climatic changes and will warp and check badly under certain conditions. This is particularly true where thin sections are used.

Quartered white oak is a very good material for use with big engines. It is to be preferred to birch in most cases.

For extreme climatic conditions such as those encountered on the Mexican border Honduras mahogany is preferable on account of the fact that it is least affected by the climate.

POPLAR USED IN MEXICO.

On the Mexican border it was found possible to get poplar that was well seasoned in that climate and this wood had to be given preference for this reason. The poplar seemed to retain its strength better under the extremely dry conditions than the

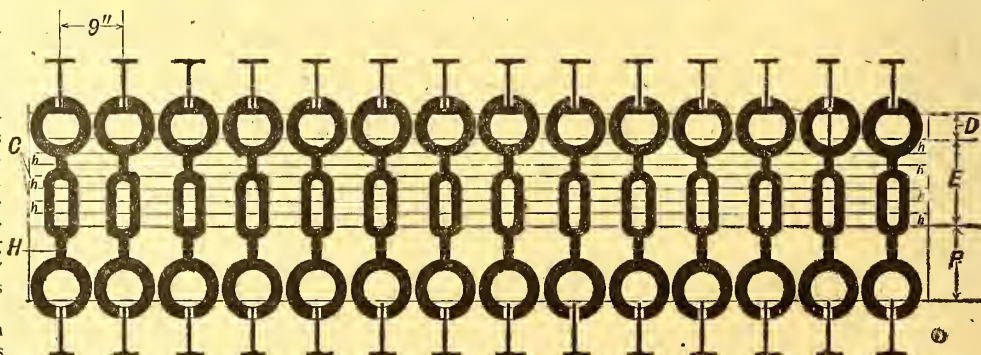


FIG. 4.—Arrangement of clamps for glueing propeller blocks. C, note that heavy ends are alternated. D, 2 in. board. F, laminations. F, block, 6 in. thick. H, 1 in. tie rod and turnbuckle. Each board is marked at the middle and placed on a knife edge. Heavy ends are alternated to allow for the unequal density of the wood.

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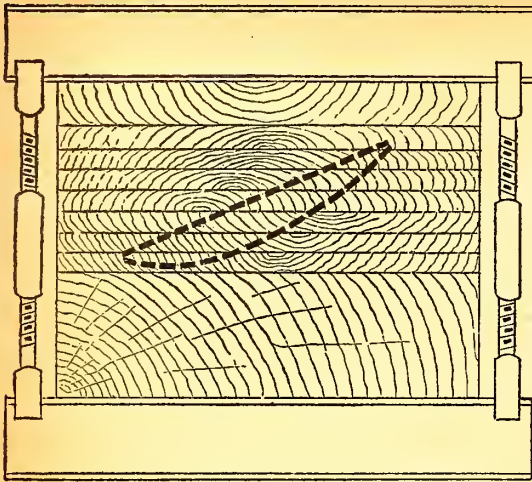


FIG. 5.—Note arrangement of boards to give edge grain on the faces of the propeller. The 2 in. board at the top should be crowned about 1/16 in. at the center to prevent excessive pressure at the edges, due to bending of the I beam when the clamps are tightened.

other woods. Most woods become brittle or "brackish" in the climate of the Mexican border.

The use of gum is not recommended as it will warp and check very badly even if thoroughly seasoned.

Ash is not recommended as it is hard to laminate properly and has a tendency to splinter.

Black walnut has not been used to any extent in the United States, but is used a great deal in England. It is probably less

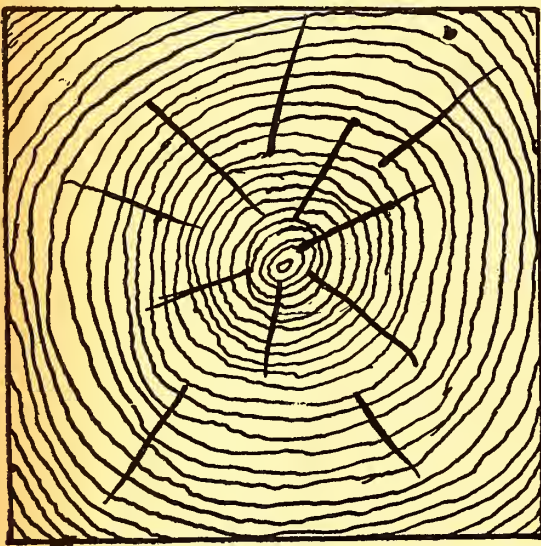


FIG. 6.—Showing the manner in which the season checks usually open up in the wood. Note that they are perpendicular to the lines of the grain.

affected by climatic conditions than any other propeller wood. The fault found with it in this country is that it is heavier than Honduras mahogany and has a lower tensile strength.

Maple is seldom used alone on account of its extreme weight.

SEASONING OF THE WOOD.

The seasoning of the wood is, perhaps, the most important consideration in the construction of propellers. In spite of this, however, properly seasoned wood has not been available owing to the forced development of the art. For the best results the wood should be air seasoned for five years before it is used. Under present conditions one is fortunate to be able to get good material that is over two years old. To facilitate drying the wood is stacked up with small sticks between each board so that there is an even circulation of air throughout the pile.

Even after the wood is

thoroughly seasoned it is best to put it through a dry kiln before gluing it up.

Figs. 1 and 2 show the principle of the construction of the dry-kiln. It will be noticed that the foul air is drawn out from the bottom. This is the proper method, as the impurities sink to the bottom.

The boards are stacked up in the kiln with sticks between and steam is turned in until the air is very damp. This opens up the pores of the wood and makes it possible for the impurities on the inside to escape. The temperature of the kiln is gradually increased until it reaches about 140 deg. F. Meanwhile the moisture is maintained so that the wet bulb thermometer and the dry bulb thermometer show a difference of 17 deg. F. (this corresponds to a relative humidity of 60 per cent. at a temperature of 140 deg. F.).

This operation should consume about three days. The temperature is maintained at 140 deg. F. and the difference of temperature between the wet and dry bulb thermometers is increased to 27 deg. F. (corresponding to a relative humidity of 43 per cent.). This will require about three days more. The kiln is maintained under these conditions for about two weeks. The steam is then cut off entirely and the air is allowed to reach its greatest dryness. The wood is now allowed to dry for three or four days.

After the wood is removed from the kiln it should be stacked up in the propeller shop and allowed to stand for two or three weeks. The propeller shop should be kept at a temperature of about 80 deg. F. and a relative humidity of about 45 to 55 per cent.

The material may now be dressed down to the thickness of the laminations. This must be done very carefully. The following thicknesses are recommended for laminations: 11/16-in.; 3/4-in.; 13/16-in. The thickness must conform to the thicknesses within 1/64 of an inch.

LAMINATION.

The selection and arrangement of the material for lamination is the next step.

Before making any effort to select the pieces to be used in the propeller it is best to lay out the shape of the laminations on a drawing. A paper pattern should then be cut to the shape of the plan outline of each lamination, cutting the edge of the pattern 1/8-in. outside of the extreme edge of the lamination. This will be made clear by Fig. 11.

In selecting the pieces of wood the pattern is laid on the board so that the grain of the wood runs along the edge of the pattern (Fig. 3) and the pattern shape is marked off on the board. All the material falling inside the mark must be absolutely free from knots, season checks, dry rot or other imperfections. In case any imperfections are found inside the mark the pattern must be shifted or the board rejected.

One method of glueing up the laminations is shown in Figs. 4 and 5, and another in Figs. 7, 8, 9 and 10.

The method of glueing the boards together in the form of a block is recommended where experienced workmen are not available. This method is shown in Figs. 4 and 5. The total pressure applied on a block 10 ft. long by 12 ins. wide will vary from about 2,000 lbs. for soft woods such as spruce to about 4,000 lbs. for hard wood such as birch. Success depends on

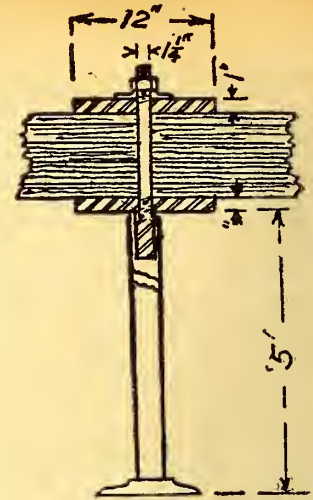


FIG. 7.—Glueing stand on which the propeller is held while the clamps are applied. Note that the hub clamp with the two flanges has a stud which fits down into the stand and which can be lifted off when the propeller is glued up.

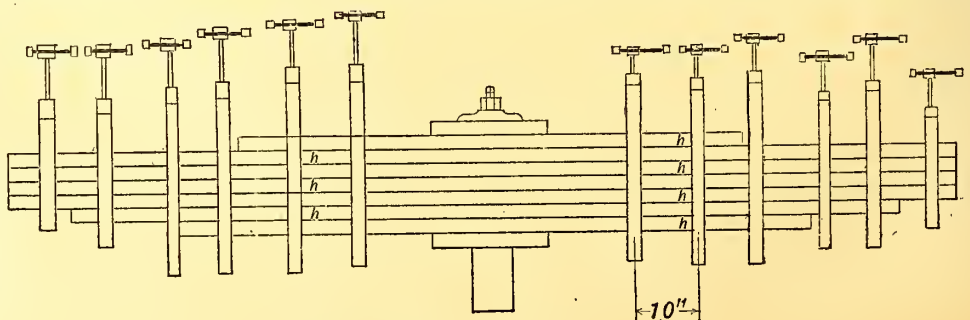


FIG. 8.—Showing rows of clamps 10 in. apart

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FIG. 9.—Plan view of laminations as above. Each lamination is put on an arbor and tried for balance on knife edge. The heavy ends are marked and are alternated as shown by the letter *h*. Unless this is done it will often be necessary to make one blade thinner than the other in order to balance the propeller, on account of variations in the density of the wood.

maintaining all portions of the glued surfaces in intimate contact until the glue has set. It requires more pressure to get this condition with the hard wood than with the soft. Fig. 5 shows the arrangement of the boards necessary to get edge grain. This is quite important, as the wood is much less likely to warp or season check if the edge grain is exposed to the surface. Examination of a few pieces of wood will show that season checks nearly always open up in the direction shown in Fig. 6, i.e., perpendicular to the lines of the grain. In practice this will be found to be quite important.

For quantity production or in any case where economy of material is important the method shown in Figs. 7, 8, 9, 10, will be used. This method requires a little more care than the one shown in Fig. 4, but equally good results may be obtained if the work is carefully done.

GLUEING.

The choice of the glue to be used will depend upon its reliability in practice more than anything else. Laboratory tests serve to eliminate brands that are very weak or are too readily affected by moisture. An important requirement is that the glue shall not chill for some time after it is applied. Failures from this source are quite common in practice and, unfortunately, they cannot be eliminated by inspection. A glue that has been used with very good results by the writer is Baeder and Adamson's No. 997-W.

The glue should be soaked in cold water for from 18 to 24 hours and heated up gradually during three or four hours to about 160 deg. F. (Some grades of glue require a lower temperature). Since the viscosity of the glue rather than its specific gravity determines the working qualities it is desirable to mix it to a proper consistency or thickness rather than to mix the ingredients by weight. The glue should be made up fresh each day for the best results.

Before being glued together the laminations are toothed with a toothing plane or with No. 2½ sandpaper. This gives a surface suitable for glueing. The laminations are then put in the glue room for two or three hours.

The glue room should be kept at a temperature of about 100 deg. F. and should be provided with a steam box kept at a temperature of about 135 deg. F.

The laminations are placed on the stand shown in Fig. 7 and are arranged in the exact way in which they are to be glued. Each lamination is marked with a pencil along the edge of the next lamination above so that it may be easily located in glueing.

The laminations are placed in the steam box for about an hour and are then ready to glue. The glue is applied to both sides of the boards. It should be applied evenly and rapidly. The whole operation of glueing should not consume more than 15 to 20 minutes for the best results.

The method of applying the clamps is shown in the sketches.

percentages of the failures encountered where the work is carefully done can be traced to this source.

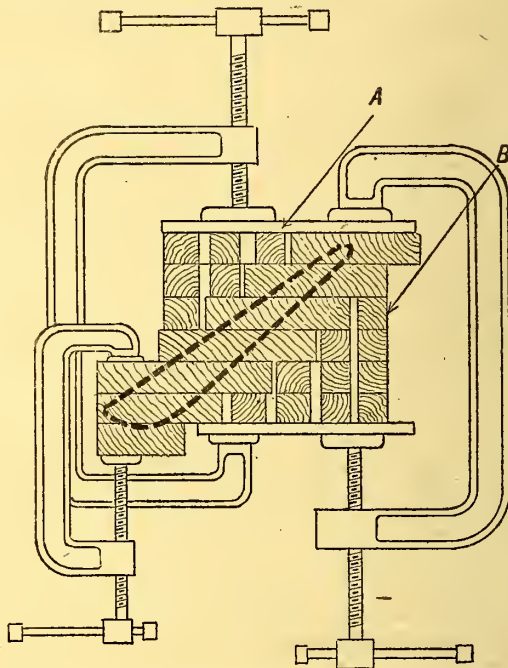


FIG. 10.—Arrangement of each row of clamps shown in Fig. 8. Note the edge grain along the dotted line which represents the finished section of the propeller. *A*, strip of maple, ¾x1½ in. *B*, small square blocks, about 4 in. long. These are dipped in paraffine or coated with shellac to prevent the glue from sticking. It is necessary to have sets of these for each lamination thickness that is used.

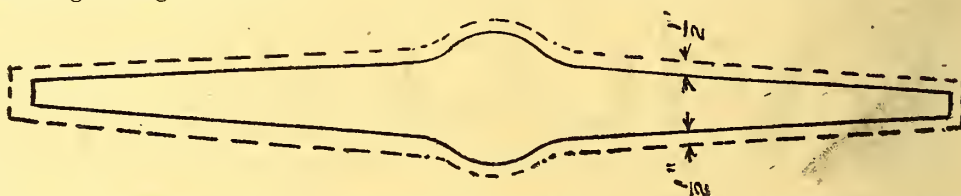


FIG. 11.—Shape of pattern for sawing out the laminations. The solid line indicates the shape obtained from the drawing and the dotted line the proper shape to saw by.

THE PATENTS INDEX.

The subjoined index of recent inventions has been specially compiled by THE AEROPLANE from the current Official Patents Records.

PATENT APPLICATIONS.

- | | | |
|-----------------------|--|---------------------|
| British Emaillite Co. | Waterproofing aircraft fabrics. | No. |
| 7451. | May 23rd. | |
| British Emaillite Co. | Covering wings, etc., of aeroplanes. | No. |
| 7453. | May 23rd. | |
| British Emaillite Co. | Air screws of aircraft. | No. 7454. May 23rd. |
| Dawson, N. | Dirigible explosive torpedo. | No. 7419. May 23rd. |
| Jones, E. H. | Aircraft. | No. 7521. May 25th. |
| Saunders, S. E. | Aeroplanes. | No. 7490. May 24th. |
| Sopwith Aviation Co. | Tool for extracting fixing-bolts of propellers of aircraft. | No. 7367. May 22nd. |
| Tarrant, W. G. | Construction of and method of joining together girders, beams, struts, etc., of airships. | No. 7643. May 26th. |
| Woolidge, W. W. | Fuel-feeding appliance for flying machines, motor boats, cars, etc., also applicable to radiators and evaporators. | No. 7410. May 23rd. |

Wright, W. T. Life-saving appliance for use on airships, balloons, etc. No. 7613. May 26th.

COMPLETE SPECIFICATIONS ACCEPTED, PRINTED COPIES OF WHICH ARE OBTAINABLE ON AND AFTER JUNE 14TH, 1917.

- | | | | |
|----------|-------------------|------------------------------------|--|
| 106,299. | April 18th, 1916. | King, W. J. H. | Torpedoes, aircraft, or the like. |
| 106,352. | June 15th, 1916. | Parker, J. W., and Abrahams, E. G. | Means of propulsion for aircraft. |
| 106,408. | Sept. 29th, 1916. | Reynolds, A. J. | Arrangement of guns on aircraft. |
| 106,441. | Jan. 12th, 1917. | Castle, J. P. | Means for securing tension wires in aeroplanes and other aircraft. |

RECENT ABRIDGMENTS OF PUBLISHED SPECIFICATIONS.

105,051. Internal-combustion Engines. GUYOT, H. R., 51, Avenue Jean Jaures, Paris.

CYLINDERS, COOLING.—In an aeroplane, dirigible balloon, etc., the radiator and cylinders are cooled by separate air currents. A stream of cold air produced by the speed of the aircraft enters an opening *b*, Fig. 2, in the casing *a* and, after cooling the motor *d*, passes through a passage *e*, formed by a pair of partitions, escaping through holes *f*.



ARMSTRONG, WHITWORTH

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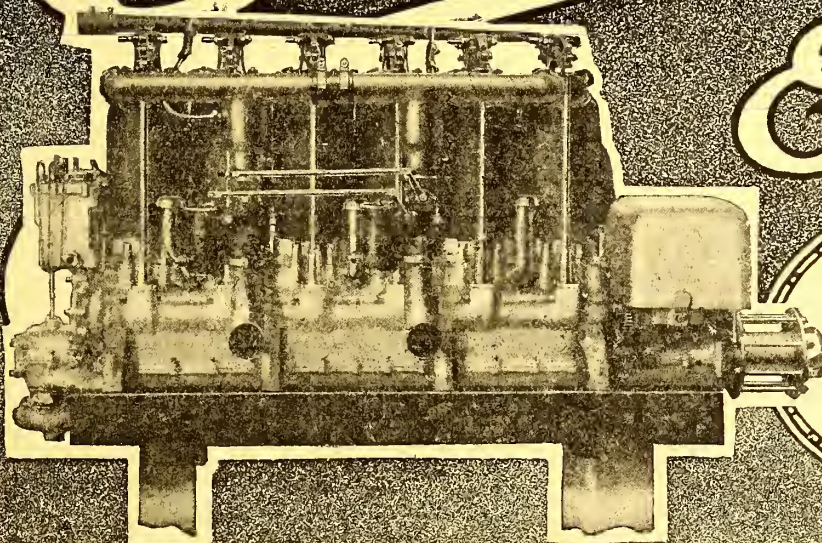


TELEPHONE :- 500 GOSFORTH.

TELEGRAMS :- ARMSTRONG AVIATION,
NEWCASTLE ~ ON ~ TYNE.

Beardmore

Aero Engines

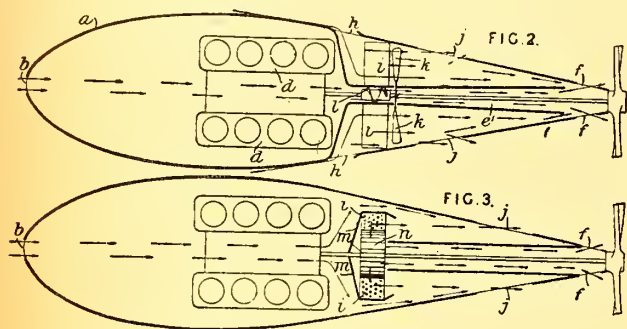


"An Engineering Job."

Proof of which is manifest by the records held by the Beardmore.

THE BEARDMORE AERO ENGINE Ltd.
London Showrooms and Depots:
112, Great Portland Street, London, W.1.
Telephone: Gerrard 238

The radiator *i* of the motor is cooled by air entering holes *h* and escaping through holes *j*, *f*. A screw *l* of quick pitch may be arranged in the passage *e*¹, and a fan *k* may be arranged behind the radiator *i*. In a modification, the stream of air from the opening *b* meets a deflector *m*, Fig. 3, and escapes wholly through holes *j*. A fan *n* draws in air from holes *f* and dis-

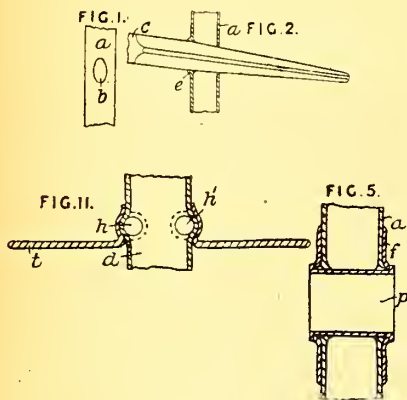


charges it through the radiator *i*. In the tractor type of aeroplane, air entering an opening *b* is guided past the radiator into the casing surrounding the cylinders, the currents that cool the radiator flowing away outside of such casing. Or the air that cools the radiator is guided into a trunk which passes between two rows of cylinders.

105,058. Making Tube Joints, Bearings, etc. AMIOT, F., Seine, France. 1916, No. 17335.

To form a cylindrical hole transversely through a metal tube to serve as a joint for tubular framework or as a bearing for a rotating or sliding part, elongated openings *b* are cut in the tube

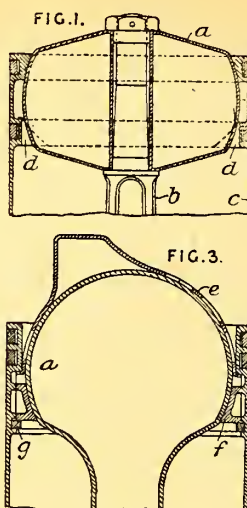
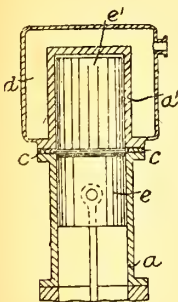
a, and these are expanded and shaped by a conical ribbed tool *C*, Fig. 2, which thickens the edges *e* of the openings. The tool, which may have a cutting-edge, is rotated alternately in opposite directions and is subjected to a constant end pressure by compressed air or other means; it may have a central conduit for cooling or lubricating fluid. The tube may be an-



nealed. Fig. 5 shows a bearing-sleeve *p* placed in the tube *a* which may be reinforced by an outer tube *f*. For a joint, the tube inserted in the openings in the tube *a* is fixed by solder or a pin. In the case of a T-joint, the opening is in one side only of the tube, and the inserted piece rests against the opposite side. Modifications are described in which one or more small tubes are passed through a larger tube at one or both sides of its axis. Fig. 11 shows such a construction, in which two tubes *h*, *h*¹ are jointed to a tube *d* attached to the tiller *t* or control lever for aircraft. The invention is applicable to aircraft construction, cycles, vehicles, piers, carpentry work, hand-rails, beds, and conduit-pipes.

105,068. Heat Engines. LEFEVRE, H. A., 12, Rue du Lincoln, Paris.

CYLINDERS, COOLING; PISTONS.—The part *a*¹ of the cylinders of internal-combustion and other heat engines that is in contact with hot gases is insulated from the remainder *a* by a layer of non-conducting material *c*; it is also jacketed with heating fluid in the casing *d*. The piston *e* is insulated from its head *e*¹ and is not in contact with the part *a*¹ of the cylinder.

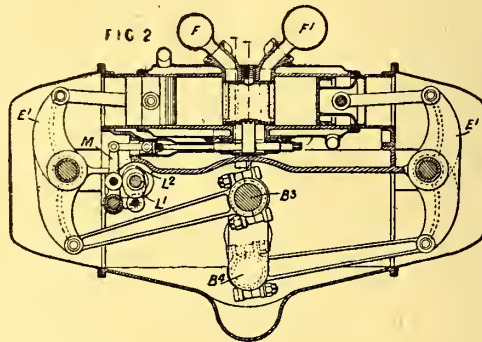


105,085. Connecting-rods. HENRY, H. D., 22, Grosvenor Road, Chiswick, London, HINDLEY, H. D., The Mount, Bourton, Dorsetshire, and BIGGS, T. J., 102, Middleton Hall Road, King's Norton, Birmingham.

In an aeroplane or other engine, the connecting-rod is formed with a hollow head of nearly the same diameter as the cylinder, making a spherical joint with a sleeve sliding in the cylinder. In the arrangement shown in Fig. 1, the head *a* forms a spherical joint with a sleeve *c* provided with packing-rings. The head is inserted through slots *d* in the lower bearing-surface, and is then turned at right-angles and secured to the rod *b*. In Fig. 3, the head is shown secured between a cap *e* carrying a baffle and a lower bearing-ring *f* secured by a ring *g*. Alternatively, the sleeve *c* may be in two parts clamping the head *a* and secured together by a split ring of U-section. The sleeve may be formed with a spherical cap such as *e* clasped by a spherical plate bolted to the head *a*, the cap being slotted to permit oscillation of the plate.

105,095. Internal-combustion Engines. LAMPLUGH, F., Trafalgar House, Waterloo Place, London.

FOUR-STROKE-CYCLE ENGINES; DRIVING-GEAR; VALVES; VALVE-GEAR; REGULATING.—The engine comprises a pair of cylinders with pistons in both ends, the piston in one end driving a single crank *B*³ through a lever *E*¹, and those at the opposite end driving in the same way an opposite crank *B*⁴. By uniting two such engines with their contiguous cranks coincident, a balanced engine is obtained. When used on flying machines, a shaft mounted above the crank-shaft and parallel to it carries the propeller. A tubular slide valve as is described in Specification 39/11, controls the passages leading from the admission pipe *F* and to the exhaust pipe *F*¹. The valve is moved in opposite directions by cams *L*¹, *L*² respectively, acting through a lever *M* which is mounted on eccentric bearings to take up wear.



THE SEVEN STAGES OF 'PLANES.

First the Woodwork
Waiting to be assembled; then the Fuselage
With Undercarriage fitted all correct;
And then the Engine's fitted with the Wings;
The fourth stage sees the Aeroplane complete
With covering, controls, and all the rest.
The A.I.D. inspects, and when she's passed
Their test severe, across the sea she's sent
To chase the Hun, and scrap, and come again.
And there she stays until the Powers that Be
Out at the Front do one and all agree
That she is useless for such work as theirs.
The School stage is the sixth, when, in old age,
She teaches willing youngsters the new game.
The last stage comes when some adventurer
Has a tremendous crash and thus she's fired
To his machine, then there alone remains
The charred and battered fragments of a 'plane,
Sans wings, sans tail, sans wheels, sans everything.

K. A. B.

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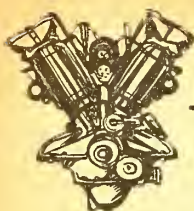


WORKS & OFFICES: { CRISP ROAD, HAMMERSMITH, W.6. } LONDON.
 { CHURCH WHARF, CHISWICK, W.4. }

TELEPHONES: 1910 HAMMERSMITH (3 lines).
 1780 CHISWICK (3 lines).

TELEGRAMS: "GWYNNE, LONDON."

KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.



AERO-MOTORS

IN KIND AND CONSTRUCTION

By Geoffrey de Holden-Stone



THE ROTARY PREDILECTION.

After lectures and like foregathering; when one abandons the ostensible subject of the occasion to talk of the "little things one cares about," I still meet men who swear by the rotary type, especially—as they aver—for the commercial flying of the future. Nearly all these men are practical pilots whom Providence has preserved from the early days. So, personally, I sympathise respectfully—there is always much in what any practical man says—even if I am far from agreeing wholly.

From the maker's standpoint, a rotary does seem to be a commercial proposition, on the long series. Given a simple design, with no elaborate valve-gear, there is none that should need fewer machine tools, or fewer operations therewith. And the finer the steels the better, because you can sooner arrive at a permanent standard way of shaping and tempering the cutting faces which these steels like best: and so get to the long, deep, slathering cuts which win your output and your profits. Most of which, incidentally, is hardly appreciated by many of our well-intentioned British munitioners.

Again, we can understand this steadfast affection for the rotary—especially when so much deadly nonsense as to the virtues of high-speed automobile derivations that cannot cough out another hundred r.p.m. at the top-level altitudes, passes current—because it did deliver all its horse-power, and that of an astonishing quality if you forgot that it was progressive kinetic energy with non-reciprocating pistons, as compared with the inertias of passive piston-strokes in flywheel-less stationaries.

For all of which honest merits we may be sure that the rotary will abide for many good after-the-war services—within its limits.

THE DEFECTS OF THE SPECIES.

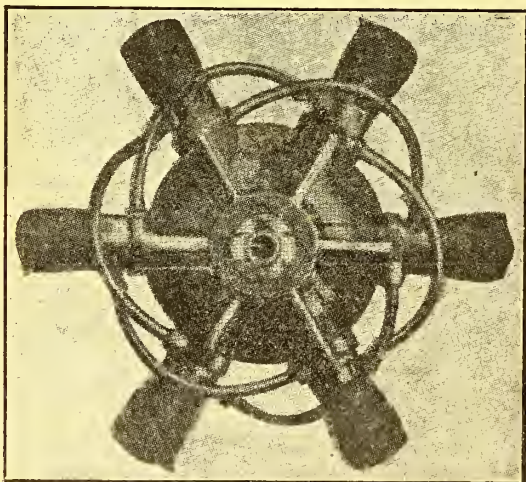
But this does not do away with the fact that its very type, which serves it so well for moderate powers, disqualifies it wholly after the 150 h.p. mark, when we are striving for four times as much. Or that other fact that it is like a short-necked Deccanee, an unbridled beast, unless it can run all out, all the time.

Which may be good enough for the kites we have hitherto put up with, but does not tend to improve the breed of aeroplanes, in the matter of speed-range and aero-curve developments. It is really high-time we got back to that view-point of which A. V. Roe was the chief priest: for if we do not, we shall never get anywhere with commercial aviation, little or big.

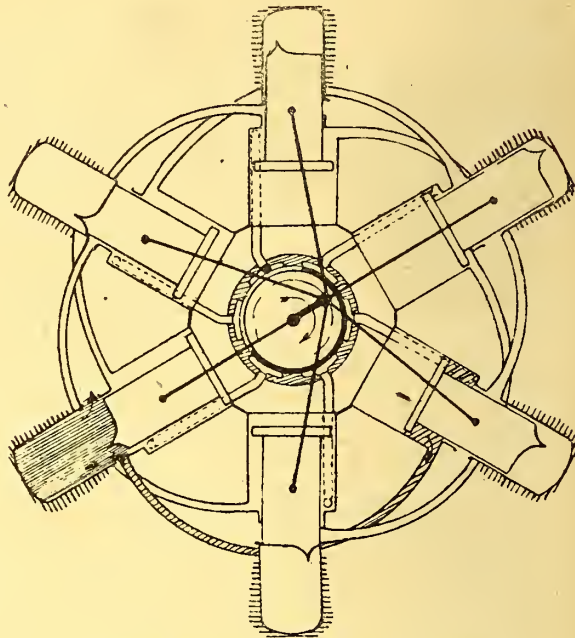
And, thirdly, there is the inherent vice of the rotary, with few exceptions due to special counter-design, that its power goes but a pint and three-quarters to the quart-pot. It is no excuse to say that the high-speed freak is not drawing much more than a pint in the top-stories of celestial mansions. For there, more than anywhere else, we must have the full quart.

AND THE TWO-STROKE ASPECT.

Here, again, the two-stroke cycle—in which forced induction is more or less inherent, and the appropriate degree thereof mostly a matter of design—is so particularly attractive: so promising—



The Laviator Two-stroke roto-radial motor.



Sectional diagram of the Laviator motor.

apart from any question of mechanical simplicity and weight-savings—also in regard to its theoretical two to one power ratio; which is always to be realised—and, in some actual instances, has been—in practice.

There is, too, no denying the equality of the two-stroke and four-stroke cycles on the score of thermal efficiency and friction losses: so it is no wonder that the attention of those designers who prefer progress to publicity is ever more drawn to the possibilities of the former than the mere ameliorations of the latter.

A NOTABLE EXAMPLE.

But add to all this the kinetic-energy values of the rotary type, and the proposition becomes more than ever interesting, especially when there is a prospect of getting a dozen cylinders to work on two cranks in one case, and sixteen on four in another: to be the possible equivalents of twice as many in four-stroke practice.

The particular example in the former instance is the Laviator roto-radial; which, although shown as lately as the 1913 Paris Aero Salon, had even then—like most two-stroke—to have its merits proved by the discarding necessities of war-aviation. As the sectional illustration shows, it is valveless, and on the whole could hardly be simpler, mechanically. Of course, it has the obvious defect of the old-fashioned position of inlet port opposite exhaust and the equally *vieux jeu* deflector-stopped piston attempt to prevent exhaust losses.

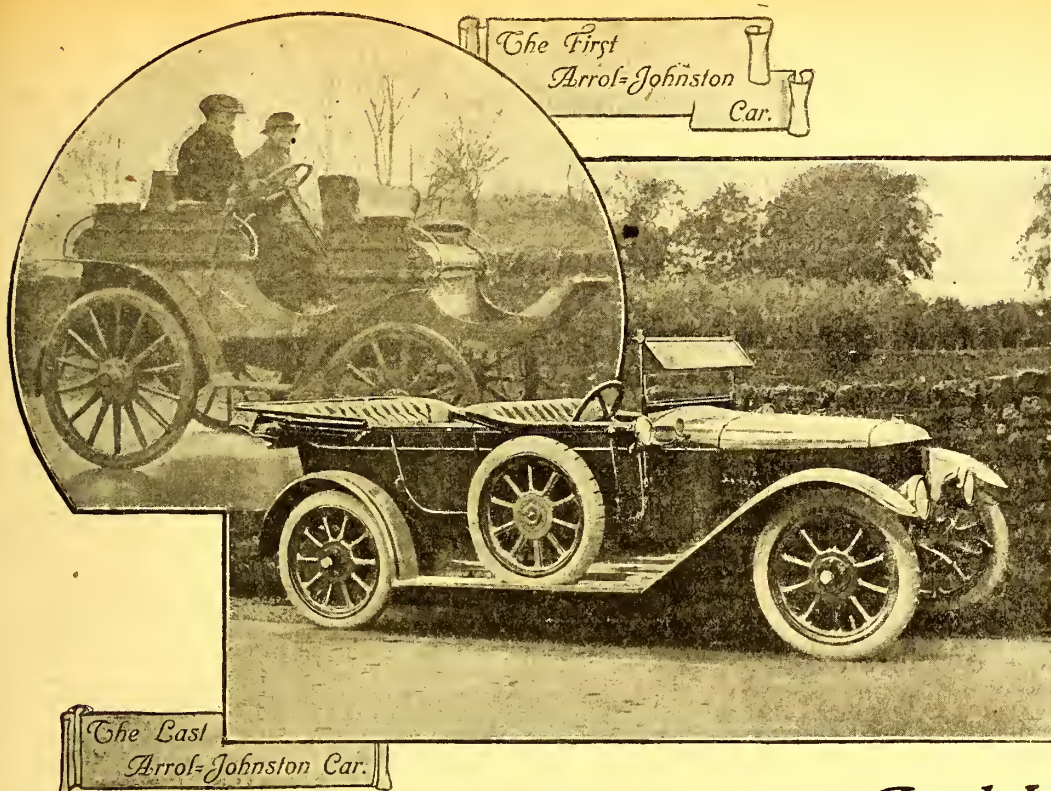
That defect—as the Watson-Fleming experiments of 1910 finally proved, though some of us had recognised it years before—is practically fatal to any stationary motor running below 1,000 r.p.m.: as the loss of fresh mixture is anything up to 36 per cent. Even so, however, as speeds increase, this loss is considerably lessened, being not much more than 15 to 20 per cent. at 1,200 r.p.m.; and at 1,500 r.p.m. actually not more than 5 or 6 per cent.

ITS GENERAL ASPECT.

But in a rotary such as the Laviator—in which the normal r.p.m. happens to be just 1,200, with an available maximum of 1,600 r.p.m., this 6-15 per cent. mixture-and-power loss is not excessive; and what with the forced-induction of the differential or stepped pistons added to the kinetic energy gain, seems to be practically offset.

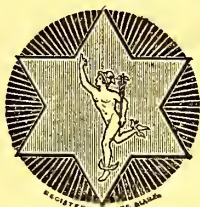
At any rate, for the cylinder capacity of the model in question—95 mm. by 130 mm., certainly not more—the power at 1,200 r.p.m. was exactly 50 h.p. The full quart at least.

But the kinetic-energy-values were considerably lessened in the case of the Laviator by the fact that the mass weight of the motor—owing to the differential type of piston and the



and the next
will be worth waiting for.

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bulkier annular pumping chambers in which they moved—was central rather than peripheral, in the usual manner of rotaries. Constructionally, on the other hand, it is probable that this arrangement scored as to strength and durability. The outcome as a rotary at any rate was that while 50 h.p. was the best delivery at 1,200 r.p.m., as a radial with its pistons in diametrically opposite balance, all but off-setting each other's weight and inertia, the Laviator gave a full 65 h.p.; which at 198 lbs. for the whole, represented only a decimal above 3 lbs. per h.p.

THE SPECIAL FEATURES.

Now from its very simplicity, even, the actual mechanical points of the Laviator are liable to escape notice, much more appreciation. The piston-cum-cylinder design and arrangement is clear enough: but it might appear as if crank-chamber primary compression and induction were part of the working scheme.

That, however, is not the case. As usual, in rotaries and some radials, the hollow crank-shaft serves as the main induction trunk. But instead of being drawn into the crank-chamber—as in the best-known four-stroke rotaries—the mixture enters a drum formed solid on the crank-shaft, concentrically and closely fitting within a similar drum formation in the crank-chamber casting.

This is the reverse of R.E.P. or Anzani practice—and 'as will become evident—has to be; but the same general principle is embodied.

One-third of the wall-circumference of this drum is slotted out to constitute a port for two charge-pumping cylinders at a time; while the remaining two-thirds—indicated by the black curved line is most ingeniously made to serve as a dead cut-off valve forwards, and as a non-return valve backwardly, on the same outer face. Four of the cylinders—from ten past to twenty to—are shown in that position.

Here it may be suggested that if the top end of this main inner port had been slanted athwart the drum, instead of being transverse, a more gradual cut-off would have been obtained, which would have been useful at the latter end of the primary induction outstroke when the suction has died out. It is a golden rule in the port-cutting of two-stroke motors never to be abrupt: for the port-formation itself will secure the definiteness of the cut-off.

CONCERNING THE PORT CUTTING.

As to the explanation of the precise widths of this main port, the feed ports in the outer drum, and the intervening spaces. There are six cylinders. Two are intended to be pumping in mixture at a time: and two is a division of six. Therefore, the main port must be one-third of the circumference. Now theoretically each feed-port and the dead space next to it, should make up half of this third, or its sixth, as representing one cylinder unit; this being a two-stroke proposition. But in practice there must be a dead-space on the leaving side as well as the entering one, for each cylinder. Therefore, on this open third, the space in the outer drum-circumference has to be divided not into sixths, but into sevenths: each feed-port taking a two-sevenths width,

and each dead-space one-seventh. Which just provides for the continual odd leaving side-space.

AND THE RESULTS.

All this is a calculation merely for the port-cutting as to admission and cut-off moment: and does not affect the diameter of the feed-pipes—which are drilled in the casting, like so many hollow ribs as shown in the external view, not as in the sectional drawing—nor the capacity of the annular pumping chambers. But it should be noticed—as a point of two-stroke fluid-pressure physics—that both these feed-pipes and the subsequent wreath of transfer-pipes are of small diameter, purposely to induce automatically a fairly high mixture velocity.

Now this point—in itself of importance in view of the relative positions of the final inlet and exhaust ports—is of greater importance still—especially in a two-stroke motor—not only to insure full-charging and full power delivery, but also a greater flexibility range from the normal of 1,100–1,200 or so up to 1,500 r.p.m. at need for high altitudes: in all of which the forced induction of the differential pistons is naturally helpful. Yet all under throttle-control! What a contrast to other rotary propositions: especially four-stroke, with the mixture chasing itself round hair-pin corners all the time.

HOW THE LAVIATOR WORKS.

Notice now the system of final induction in the Laviator. The motor is turning clockwise. In the cylinder at seven o'clock, the firing-stroke—"detente"—has just finished on the top of the piston, and the full vacuum just been created in the annular chamber at the lower end. Its working end is, of course, in the position to receive its final induction charge from some other cylinder.

But notice that it is not getting it from the cylinder at three o'clock—because the position of that piston relatively to the crank does not allow it to be sufficiently advanced for forced induction—but from the piston and annular chamber at four o'clock, 120 deg. behind, which had induced the charge primarily at the nine o'clock position and onwards to eleven o'clock, and had carried it from that position past two o'clock.

Similarly, the piston at seven o'clock will start its primary induction as soon as its feed port runs past eight o'clock, and will keep on through nine and eleven o'clock, until it gets its full charge at twelve, and leaves at one o'clock loaded. Then it gets ready to fill the working cylinder—here shown as at four o'clock—as soon as the latter comes to eight o'clock: it being understood that the cylinder shown at three o'clock is just approaching final compression with its previously induced charge, and is firing at five o'clock.

What action could be simpler? Or what mechanism more compact. And when, in addition, the entire motor is valveless, and consists merely of the primary elements of cylinder, piston and crank, what more commercial proposition could any maker desire for a rotary? Likewise, on the promise of efficiency, ready control, and easy maintenance shown, what better of the type could any pilot discover?

(To be continued).

MARKET REPORTS.

Prices given are for quantities on the usual terms.

May 30th, 1917.

COPPER.—There has been no fluctuations whatever in the price of Copper during the past month, and there does not at present appear to be any signs of either an advance or decline. Supplies are very encouraging, and the reports received of the anticipated outputs of Raw Copper are extremely satisfactory.

Current Prices.

Copper Ingot (Standard) Cash...	£130 per ton.
Copper Sheet	£165 per ton.
Copper Tube	20½d. per lb.
Brass Sheet, 24 Gauge	16½d. per lb.
Brass Tube, S.D.	17d. per lb.

TIN.—After declining from £256 to £251 10s. a week ago, prices have again advanced to £255, from which it will be observed that the erratic condition of the market increases.

As will be observed from the comparison of Average Prices given below, the market is fairly strong, and there appears to be every indication of it becoming stronger.

Comparison of Average Cash Prices.

To-day	£255
Last Week	£250
May, 1916	£192
Highest Price, 1916	£205

LEAD.—Prices continue the same, and supplies are very difficult; in fact, it is thought that the present shortage of Lead has been brought about owing to the official prices having been fixed too low.

Current Average Price	£30
------------------------------	-----

STEEL.—Prices still remain the same and supplies are certainly on the increase, at the same time it is practically impossible to procure Bright Steel to R.A.F. Specification 1E.

Current Average Prices.

R.A.F. 3A Steel, 38s. per cwt., Basis.
R.A.F. 1E Steel, 78s. per cwt., Basis.
R.A.F. 9A Sheet Steel, 30s. to 31s. 6d. per cwt.

ALUMINIUM.—Prices still remain unaltered, and there does not appear to be any reason to expect a revision at present.

Official Prices.

Ingot	£225
Remelted	£210

TIMBER.—The close of the month does not show any improvement whatever in the general situation of Aeroplane Timbers. There have been two or three shipments of Walnut and Mahogany received during the past week, but very little Silver Spruce appears to have arrived. There is hardly any prospect whatever of prices being reduced; in fact, there is more than a slight indication of a further increase, and supplies are likely to be more difficult than ever to procure during the coming autumn.

Current Average Prices.

Silver Spruce, 15s. to 16s., c.f.
English Ash, 13s. 6d. to 14s. 6d., c.f.
Walnut, 2s. 5d. to 2s. 7d., s.f.
Mahogany, 2s. 1d. to 2s. 4d., s.f.

Prices are for selection and delivery.

FABRIC.—Supplies are fairly good and there are no fluctuations in prices to record at present.

Current Prices.

17C Cloth, 29d. per yard, 36 in.
Spaced Fabric, 20d. per yard, 37½ in.

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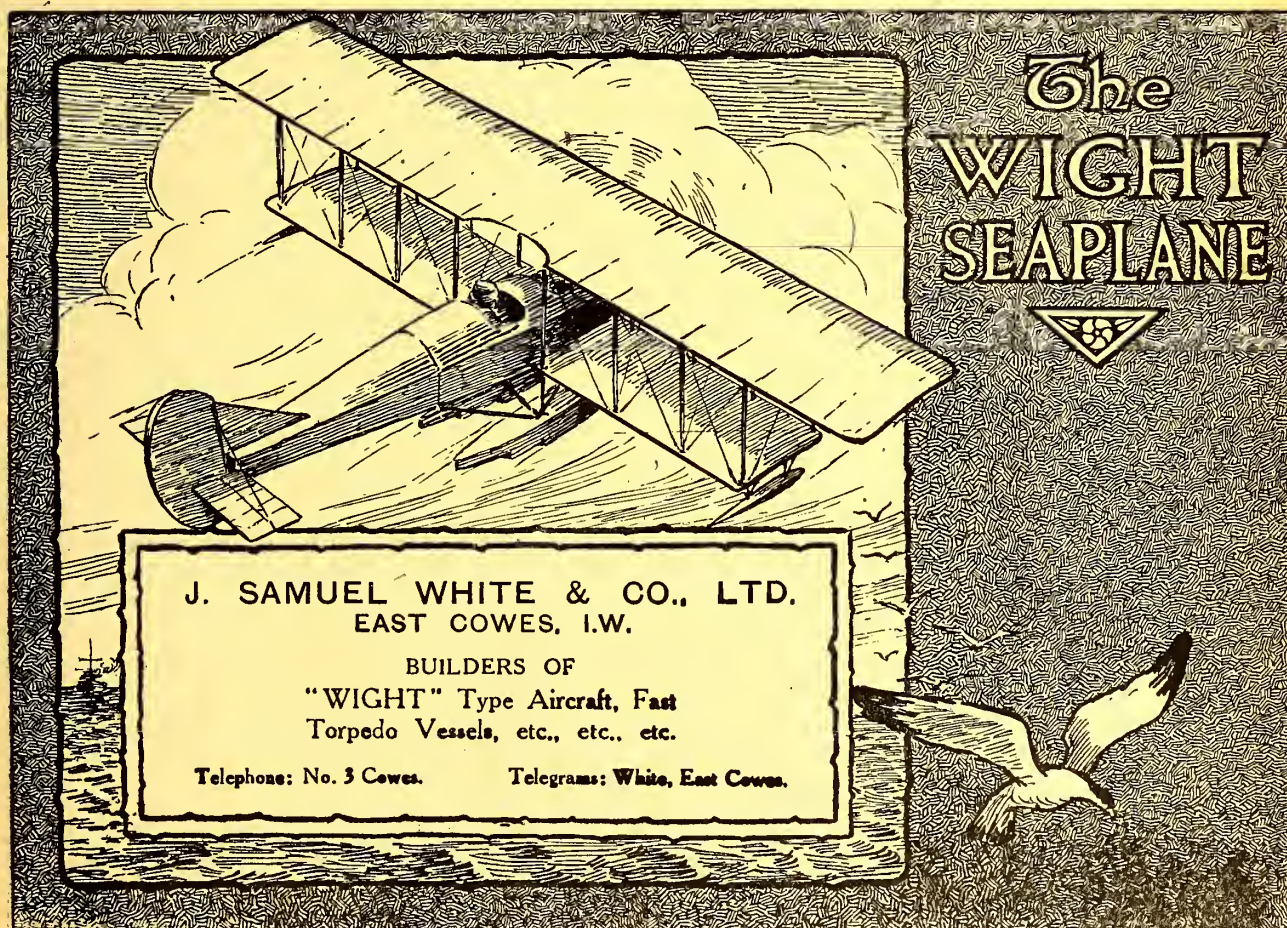
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(Continued from page 1448).

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Type B	4½d. "
Type C	5½d. "
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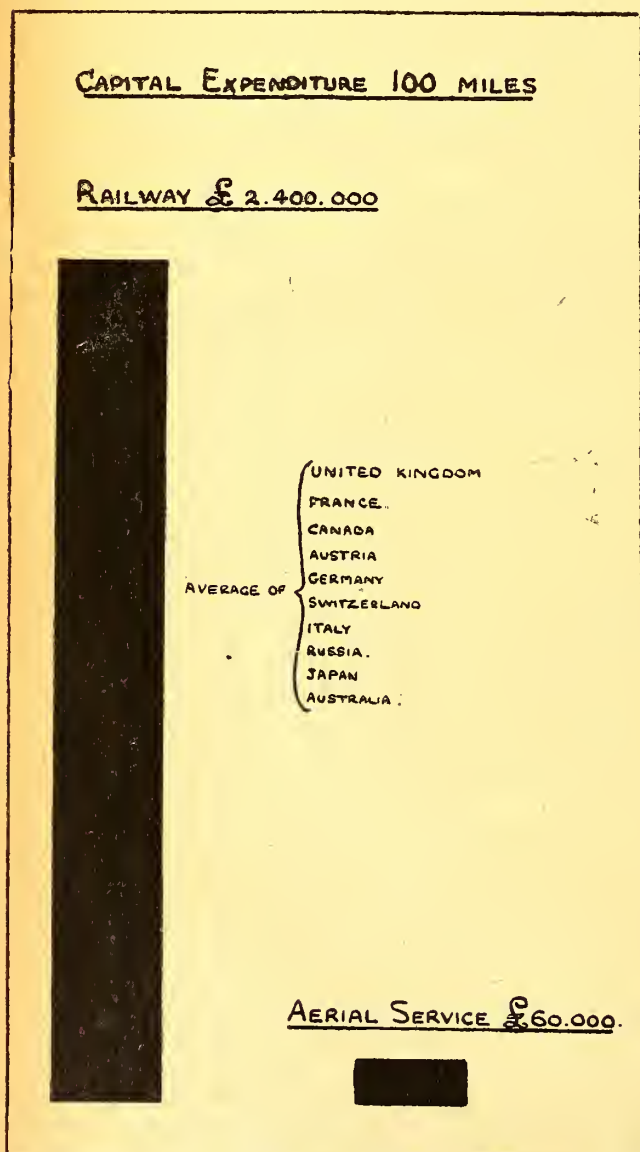
These figures, of course, refer to peace times so far as cost of petrol, etc., is concerned, but it refers to an old type of machine with about half the speed of the present-day machine. Repairs should cost less, if anything. I have further taken out the running cost per mile in the air of late types of machines of which I have intimate knowledge. These machines may all be put down as doing considerably over 100 miles per hour, but we will take them as covering 100 miles per hour, although personally I think that the wind will average itself, that is to say, one day it will be against and another day with the machine.

The cost of these machines in the air is as follows:—

- A. Carrying useful load of 1,800 lbs., including pilot and fuel, 6½d. per mile.
- B. Carrying useful load of 1,000 lbs., including pilot and fuel, 5d. per mile.
- C. Carrying useful load of 450 lbs., including pilot and fuel, 2½d. per mile.

Now in talking about the cost of aircraft as compared with other forms of transport, I have so far only dealt with the running costs and have shown you how very cheap it is, but in order that the whole of the aeronautical industry should not leave the room to register aerial transport companies, it is necessary to go into figures much more deeply, as there are other costs besides running costs. On the other hand, it is necessary to remember that before you can use a motor car or a motor lorry, you must have a road on which to run it, and the average cost per mile of this road in capital expenditure alone may be put down as about £6,000 per mile.

FIG. 2



A Chart showing the comparative Capital Expenditure per 100 miles of Railways and of Air Lines.

CAPITAL EXPENDITURE.

A railway train, before you can run it, requires a capital expenditure which, taking the average of various countries, may be put down as £24,000 per mile. Taking, therefore, a journey of say, 100 miles, as we must have some unit, the capital expenditure, apart from running cost, comes out as follows:—
Railway, £24,000,000; Aircraft, £60,000.

I do not for one moment suggest that, once the capital outlay on the railway has been made, it will not carry, to a huge extent, much more traffic than the aeroplane line, but until that traffic is forthcoming, the aeroplane will, firstly, do it without such capital expenditure, and secondly, will always do it very much faster.

The natural obstacles encountered by the railway and the road may be unsurmountable. The air is free of any such obstacles.

I will now take you through the costs of a sample route, and I suggest London—Paris as an instance. We can take it that if the journey is done in half the ordinary time we shall have mails and passengers—some because they want to get there quickly, others because they wish to avoid the Channel crossing, and a good many, at first, for curiosity. Now to start a Commercial Service we are not asking for millions of passengers or tons of mails; we are not thinking of rivalling the Tubes.

In putting these before you I would make it quite clear that they are costs of to-day, which I think it is right I should take, as if I begin to prophesy you will doubt me at once. At the same time I have not the slightest doubt that these figures as time goes on will come down enormously just as the cost of running omnibuses has come down since the time when the first petrol omnibuses nearly ruined every company running them, and I would like to say without much misgiving that within a certain period you may halve them.

FIG. D.—AERIAL SERVICE, LONDON—PARIS.

One machine each way daily.

Carrying 2,500 lbs., less Petrol and Oil and Pilot, for, say, 300 miles

Capital—

9 machines at £2,500	£22,500
Working Capital, say	12,500
	<u>£35,000</u>

At 10 per cent. interest per annum, £3,500, or
£9 6s. 8d. per day for 600 miles

Sheds—

London	£300
Dover	200
Calais	200
Amiens	200
Paris	500
	<u>£1,600</u>

Say £4 10s. per day for 600 miles

Labour—

London	12 men
Dover	2 "
Calais	2 "
Amiens	2 "
Paris	12 "

Total

At £3 10s. per week equals £15 per day for 600 miles

Pilots—

3 flights one way per week per Pilot requires for 14 flights per week 4½ Pilots, reserve, say, 1½ Pilots, equals 6 Pilots at £500 per annum each equals £3,000 per annum, say, £8 5s. per day for 600 miles

= 2,000 lbs. for Utility Purposes.

Machines—

London	2
Dover	1
Calais	1
Amiens	1
Paris	2
Spares	2

per mile.
s. d.

9

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24 gallons Petrol and 5 gallons of Oil, taking speed at 100 miles per hour	0 8
Depreciation and Repairs—	
Allowing complete overhaul every 100 hours, flying 300 miles per day at 100 miles per hour equals overhaul every 33 days. 25 per cent. off two machines at £2,500 each equals £1,250 equals £38 per day for 600 miles	1 3
Overhead Charges—	
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Advertising, etc., each end	6,000
Offices, etc.	1,000
Contingencies	2,400
	<hr/> £14,000
Say £40 per day for 600 miles	1 6
	<hr/> 1 3
Total cost per mile	<hr/> 4 8

FIG. F. PARIS—LONDON.

Profit and Loss.
 Passengers—
 Cost, say, 3s. per mile.
 300 miles = £45.
 2,000 lbs. = 12 Passengers.
 Cost per Passenger, £3 15s.
 Charge per Passenger, £5.
 Profit per Machine each way daily, £15.

12 Passengers each way, 4 machines. Profit, £43,000 per annum.	
11 " " " " " 30,000 "	
10 " " " " " 14,000 "	
9 " " " " " — "	
8 " " " " " Loss, 14,000 "	
7 " " " " " 29,000 "	
6 " " " " " 40,800 "	
5 " " " " " 58,000 "	
and so on.	

FIG. G. PROFIT AND LOSS.

Mails—
 Load, 2,000 lbs. = 32,000 ozs.
 Cost per oz., $\frac{1}{4}$ d.
 Charge, say, $\frac{1}{4}$ d.
 Charge, 3 lb. parcel, 2s.

Full load each way, 4 machines. Profit, £60,000 per annum.
 Three-quarter load each way, 4 machines. Profit, £14,000 per annum.
 Half load each way, 4 machines. Profit, £35,000 per annum, and so on.

Total cost of 4 machines each way, £130,000

FIG. H. LONDON—MARSEILLES.

8 hours.
 Passengers, £10.
 Mails, 1d. per oz.

LONDON—CONSTANTINOPLE.

20 hours.
 Passengers, £25.
 Mails, 2 $\frac{1}{4}$ d. per oz.

COMPARATIVE CHEAPNESS.

Now you will have seen from these costs that I have put before you that passenger services are not high for the speed of journey, and present a really commercial proposition, although at a competitive price they are slightly higher than by boat and train, whilst mails present an easier proposition, and it seems to me that the solution is a mail service subsidised by the Government with the right to carry passengers.

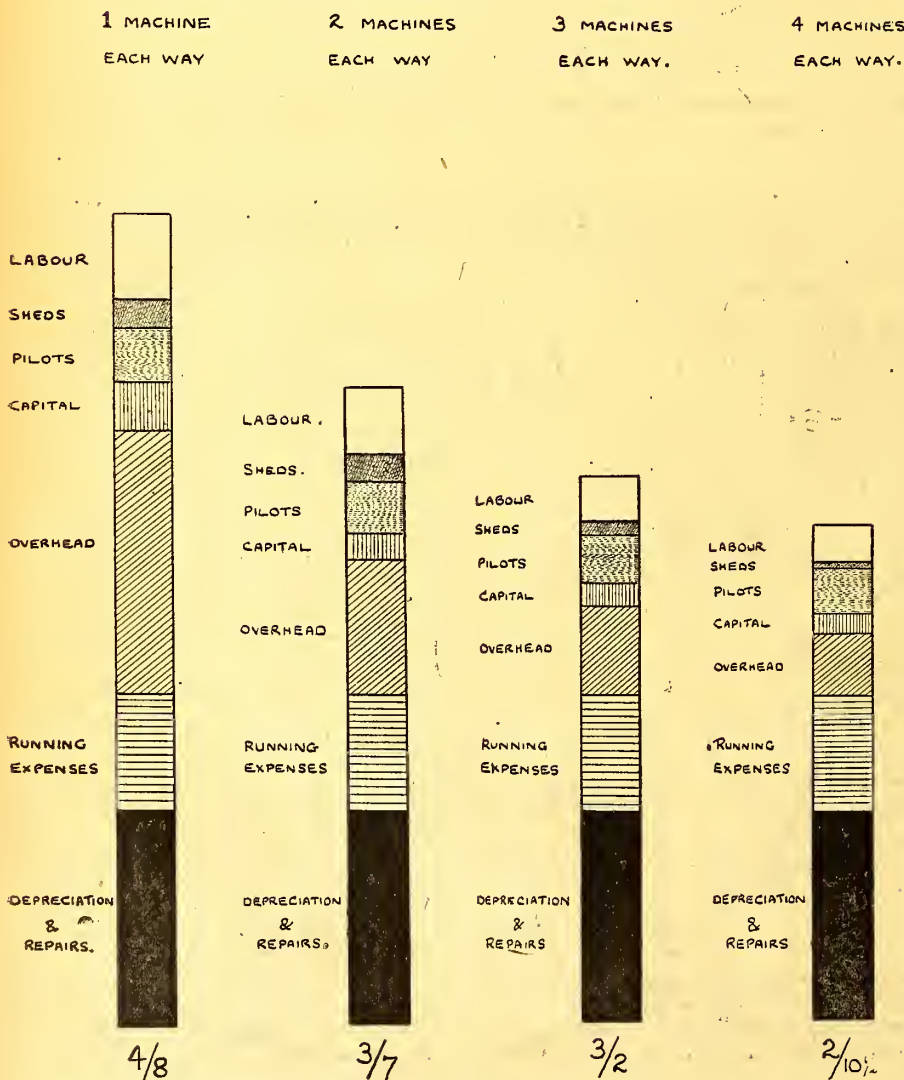
It is certain that the aeroplane is going to be used by business men for business purposes. No other mode of transport can touch it. Whether it costs 5s. per mile or £5, the business which can be done on certain occasions will only be done by arriving in time.

It will be seen from Fig. D that the total cost per mile of running a machine is 4s. 8d., running one machine each way. By reference to Fig. E, however, it will be seen how rapidly the cost comes down if two, three or four machines are run each way daily, and I think it is fair to assume that between two capitals, such as London and Paris, at least four machines each way will be necessary, and we can, therefore, for the purposes of this paper take 3s. per mile as being a safe figure.

Fig. F shows how this cost, reduced to passengers, will come out. It will be seen that the charge per passenger to Paris, at a profitable rate, so long as the machines are fully loaded, comes out at £5, which at the speed he is carried is certainly a commercial price. It will be noticed here by the figures shown at the bottom that whilst there is a good profit if the machines are full of passengers, a reduction in the full load very easily turns the profit into a loss, and this is one of the points which will have to be considered very carefully.

FIG. E.

LONDON - PARIS



Comparative Costs of Running Various Numbers of Machines.

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FIG. H.

LONDON · MARSEILLES

8 HOURS

PASSENGERS £ 10MAILS 1 D PER OZ :LONDON · CONSTANTINOPLE

20 HOURS

PASSENGERS £ 25MAILS 2½ D PER OZ :

indeed. The services *must* be started, and either subsidies or guarantee against loss *must* be forthcoming.

Fig. G shows that mails are even more commercial; that is to say, a letter weighing one ounce can be profitably carried to Paris for one halfpenny, in half the time it could reach there under the present methods, or a 3 lb. parcel for 2s. Here again it will be seen that profits can be made carrying full loads, but directly the load is reduced it is quite easy to make a heavy loss.

From Fig. H you will see that, based on our London-Paris costs (Fig. D), a passenger can go from London to Marseilles in eight hours instead of 23, at the cost of £10 per head; or that mails can be carried at a penny per ounce.

Constantinople or Moscow can be reached in 20 hours, at a cost per ticket of £25; or mails at 2½d. per ounce, both of which I think proves still more the future of commercial aeronautics.

MAIL SERVICE.

For mail services I am certain that the aeroplane can by its speed and moderate cost per letter compete with existing mail services. I have always held these views, and they are expressed very simply by the fact that I arranged with Mr. Grahame-White seven years ago to carry mails from Blackpool to Southport, and endeavoured to interest the then Postmaster-General in it.

Specialised services of all sorts will exist also. I have taken the cost of London-Paris, as it is a familiar route, and probably the most expensive, but there is another outlet for commercial aeronautics than from capital to capital, namely, providing a means of communication by which at comparatively small cost a moderate-sized community or colony may be established, say 100 miles from the railway, in many of our Overseas Dominions, and whilst small will depend on the aeroplane, and when grown large enough will have its railway. In other words, the new science of flying may be regarded as a means of development, as a feeder for the railways existing, or without laying a road at all either for motor-cars or railways, until development warrants them. Certainly on the start of such services a Government subsidy or guarantee will be an absolute necessity.

RELIABILITY.

Now another thing which you may doubt, but of which I have had considerable experience, is reliability. You can gauge this in any way you like. How many machines cross the Channel daily? How many machines fall into it? I am afraid I cannot answer these questions, but perhaps some enterprising Member of Parliament present will put the question in the House. But within my own experience, even with machines not nearly so reliable as those of to-day, I have no doubt about the reliability.

My Company, The Aircraft Manufacturing Company, has been in existence since 1911. It has delivered—I cannot tell you the number—but a great many machines to Farnborough. The only stops we can record are in four cases, and in every case these were only ordinary stoppages, such as in the case of a car, with a choked petrol pipe, or something of that sort. I will also give you a few recent instances of practical uses of aeroplanes, again within my own knowledge, although I am certain these would be confirmed and multiplied if I were to ask outside.

A short time ago the War Office required one of our managers at Chelmsford for a certain purpose. They telephoned at about 11.20 saying that it was absolutely necessary for him to be there by 12 o'clock. Here is an instance where aircraft presented the

only means of transit. Again, a recent instance is a case where the War Office telephoned asking Captain Hucks to go to Huntingdon to test a machine for them. The actual distance there and back is 116 miles, and Captain Hucks' flying time there and back was inside an hour.

I believe General Branker, time after time, has visited various aerodromes by air, putting in visits during the day which would be perfectly impossible with any other mode of transit. I met Captain de Havilland one evening at Boulogne by accident, he having flown from Farnborough to Headquarters in 1 hour 25 mins., and he tells me that this must have been surpassed many times.

WEATHER PROOFNESS.

Another point which will be brought up against flying for commercial purposes is weather, and this we may, I think, divide into wind and fog.

Now as to wind, it is to-day almost safe to say that no wind will stop a good pilot from flying. Over and over again we find in the official communiqués that during hail, snow, and storm our pilots are flying. Again, however, taking only my own experience, I will show you a wind in which flying was possible in pre-war days.

Now in this case the speed of the machine was about 60 miles per hour, and the machine, although blown to a standstill so far as speed through the air was concerned, was still flying.



To-day our machines double easily the speed, and, therefore, in the same wind still leave behind them 60 miles of distance covered. Wind is very much overrated owing to the difficulty in flying in a breeze in the early days, and I am going to show you a chart giving the proportion of days in the year on which the wind was over 40 miles an hour, which would still leave a present-day machines 80 miles an hour for covering distance. You will see that even if aerial services stop, which they certainly will *not* do, altogether on these days, it only means that for a comparatively small proportion of the year commercial aeronautics will revert to more ancient modes of transport.

Fig. J gives, by a diagram, the days in the year on which the record for South-East England, of a wind of 39 miles an hour or over is recorded. The various squares represent 365 days in the year, and it will be seen from the white squares that only 13 days are recorded in the year with a wind of 39 miles an hour or over, and if divided into hours, only 42 hours in the year. Taking one of the worst instances, viz., Holyhead, it will be seen that there are 24 days recorded in the year only, so that if you assume no flying takes place on these days, it does not seriously detract from the advantages of commercial flying. Personally, I do not think a wind of 39 miles an hour will stop an aeroplane at all, and I gave a recent instance, viz., the presentation of a machine to South Africa, only a few days ago, at which I was present. On that occasion I thought the wind was fairly strong, and I therefore asked the Meteorological Office to let me have a record, which I now show you.

Now on this occasion, as people will remember, nobody thought about the wind at all. Captain Hucks was flying all the time, taking passengers, looping the loop, etc., and certainly if he had been asked to start for Paris that afternoon he would have thought nothing of it.

The next thing is fog, certainly a bugbear, but even here you will see that it is not so black as it is painted, and again means that, even if we stop flying altogether in a fog, commercial aeronautics has still an existence. But with our aerial landing grounds in existence, no notice will be taken of local fog if our reports show that generally the line is clear. For many years, if there is a fog at Hendon, which is usual, owing to the lie of the land, we have taken no notice on long trips if our reports show the fog is only local, and our aerial service reports from all the landing grounds *en route* in foggy weather would be part of our business in conducting an aerial service.

Again, if foggy in London we might start from Dover only

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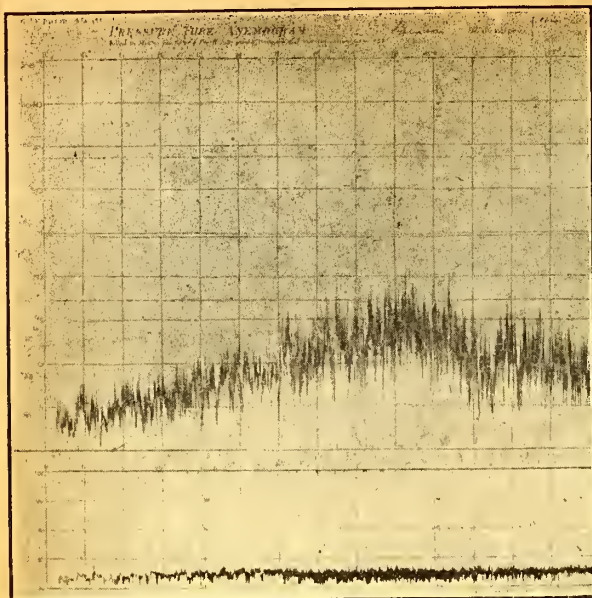
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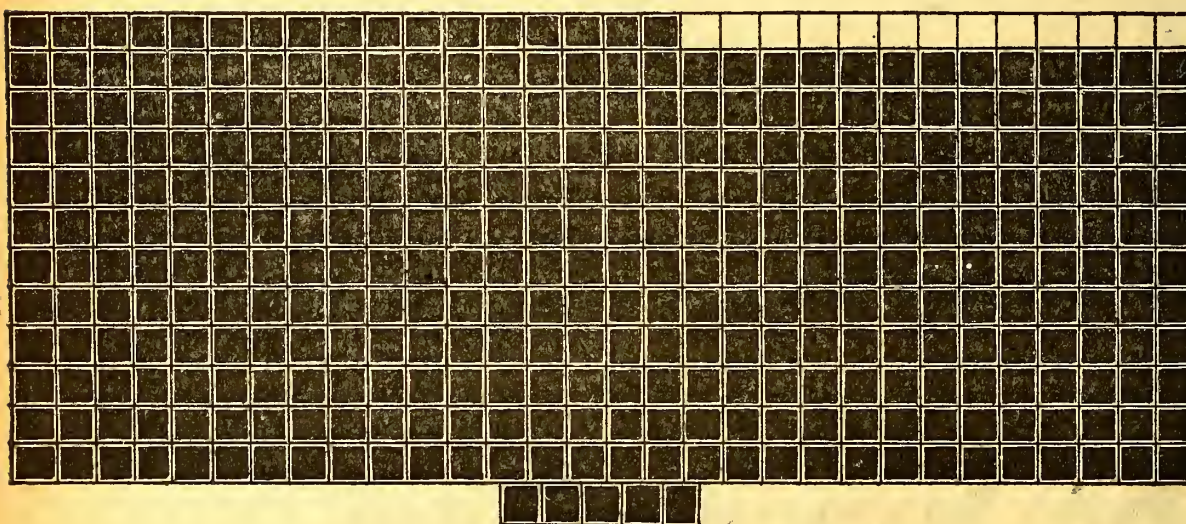
KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.



Wind Chart of Capt. Hucks' Recent Flight

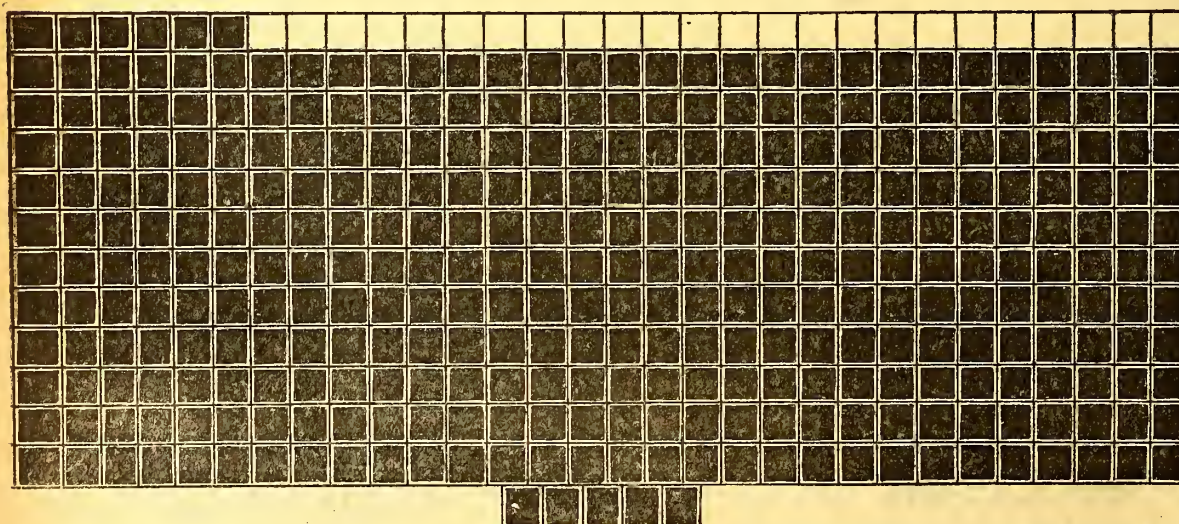
that day, forwarding the mails then by car or train, or again, we might convey the mails even to Calais, and thence on by aero-

WIND. ENGLAND. S.E. N° OF DAYS PER ANNUM. 39 MILES PER HOUR.



13 DAYS
42 HOURS

WIND HOLYHEAD. N° OF DAYS PER ANNUM. 39 MILES PER HOUR.



24 DAYS
126 HOURS

Fig. J.—Weather Charts showing the days in the year on which strong winds were recorded. The White Squares are the windy days.

plane. Necessity is the mother of invention, and I look to overcome difficulty in this respect.

Fig. L again shows the record of the Meteorological Office, and it will be seen that, taking the figures for the South Coast, omitting Scilly, at 7 a.m., there are only 12 days in the year on which fog is recorded; at 1 p.m. only five days (which shows that the fog has cleared off); at 6 p.m. five days; and at 9 p.m. four days in the year. On the right-hand side of Fig. L the record for London at 7 a.m. is shown, in which you will find only 22 days recorded out of 365. These records are presumably correct, and I believe that we attach a great deal more importance to fog than we need. If one casts one's memory back to how many times one's train is delayed by fog, and how many times even an aeroplane is delayed by fog at the present time, I am sure that we look on this matter as more serious than it is. Again, however, the question of landing grounds will also largely affect fog. I have recently combined with a flying officer in the production of a very small kite-balloon, carrying no passengers, and I believe in case of fog or night work one of these sent up, say, 1,500 ft., i.e., above fog, would practically solve the difficulty if the landing ground scheme to which I will allude later is adopted.

I have mentioned the questions of safety, weather, and fog, etc., as previously to the war I was merely looked on as an enthusiast, and none of my friends believed in aviation. Since the war public opinion has entirely changed. The man in the street no longer looks on an aeroplane as something on which somebody is mad enough to do acrobatic feats, but have a very decided belief in aircraft for war purposes, and my purpose to-night is to persuade you to believe in it for commercial purposes, and I hope nobody will leave this hall to-night without being so convinced.

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LANDING GROUNDS.

I should now like to touch on a subject which, in my opinion, is very important to commercial aviation, viz., the question of landing grounds, and my view is that we shall have to establish landing grounds all over the country and all over the world not more than, say, 10 miles apart. In talking, say, of a voyage from London to Constantinople, this sounds a stupendous undertaking, but if analysed one finds that it is quite simple.

Allowing £250 per annum as the cost of hiring and maintaining a landing ground, it means that from London to Constantinople, 1,600 miles, the landing grounds would be 160, which at £250 per annum each would be £40,000 per annum. What is this spread over the countries through which this route would pass assuming the importance of having this very vast connection all over the world? But looking at it in another way, even if the cost of a landing ground was paid by the machine which passed over it, it is almost an infinitesimal matter. Taking our previous figures of London—Paris, with eight machines per day, i.e., four each way, the number of machines passing over the landing grounds between London and Paris would be 2,920 per annum, and a tax of about 2d. per mile on each machine would return the whole costs of the landing grounds. But the London—Paris route will also be the running line for many other services beyond Paris and London.

I regard the landing grounds as being of the greatest importance. To start with, no country can have machines flying over it without control, and therefore a landing ground on entering a country is necessary, putting it on the lowest ground even of smuggling goods into the country. Then again, I believe if I asked anyone in this room to fly from London to Tokio they would say, "You will never arrive there," but, on the other hand, if I asked them to fly 10 miles, they would know that they would certainly arrive; and therefore to credit what I have told you so far, I am going to tell you it is important to regard these long distances as merely 10-mile stages.

This question of landing grounds affects every point in my argument. Safety, for instance. The forced landing, the bugbear of aviation, will be avoided, as a pilot with a machine at a height of 3,500 ft., even if he stops exactly in the middle of two landing grounds, will arrive at either, but the probability is that he would be very much nearer one. We may therefore consider London to Tokio as aerodrome flying—that is to say, the pilot will always have a flying ground to alight on. As regards the pilot, he will have no strain in keeping his eyes open for a landing. He will simply fly on, passing Flying Ground No. 27, 28, 29, etc., knowing that he is always safe if his motor stops at any moment.

FOG SIGNALS.

Then again, the question of fog will certainly be overcome at once by 10-mile landing grounds. Some form of mark will easily be developed, such as a smoke signal, some form of penetrating searchlight, or some other device, such as the small kite balloon I have recently devised.

The question of night flying is again solved by the landing ground, as with a searchlight every 10 miles a pilot can fly on regardless of maps or routes, always with the searchlight guiding him.

I am not, of course, suggesting that landing grounds should be aerodromes; they should be simply fields, which need not be absolutely on the line of route, with probably a telephone box, and some with searchlights, and some with sheds. This scheme has already been carried out in Italy, and has been entirely successful, as I believe I am safe in saying that the cost of the landing ground has practically been repaid by the saving in smashes on landing in what is a somewhat difficult country. By the courtesy of Major Perfetti, of the Italian Flying Corps, I am able to give you an illustration of a portion of the map showing the landing grounds, etc.

Now I will ask you to accept this idea of the 10-mile landing ground as being perfectly feasible from a national point of view and from an international point of view, but it is a matter in which Great Britain and the British Empire should take the lead.

The landing ground scheme also presents a method of avoiding collision in the air, which is bound to happen if no arrangements are made, and it would be very simple for an outward pilot to keep to the right and an inward pilot to keep to the left. Then again, once you accept this proposition, even crossing the Atlantic becomes feasible. What is to prevent us having a ship, not necessarily anchored, but always cruising, say, every 50 miles from the Azores to Newfoundland. On the North Sea you will find the pilot cutters which are there from one year's end to another, with the pilots awaiting inward and outward bound ships. Compared with the enormous scheme a mail between London and New York will present, the cost of 10 or 20 ships (which may be simply fixed lightships if feasible, or small cruising ships if necessary) is infinitesimal.

I understand that the number of week-end telegrams, 4s. 6d. for 25 words, which are not able to be sent because the lines are so full, is enormous, but this is nothing compared to the tonnage of mails which would be available if they could be carried from London to New York and *vice versa* in two days.

It is harking back to a very long time ago to the Pony Post in America, out in Mark Twain's "Roughing It" you will find an account of letters being carried 2,000 miles in eight

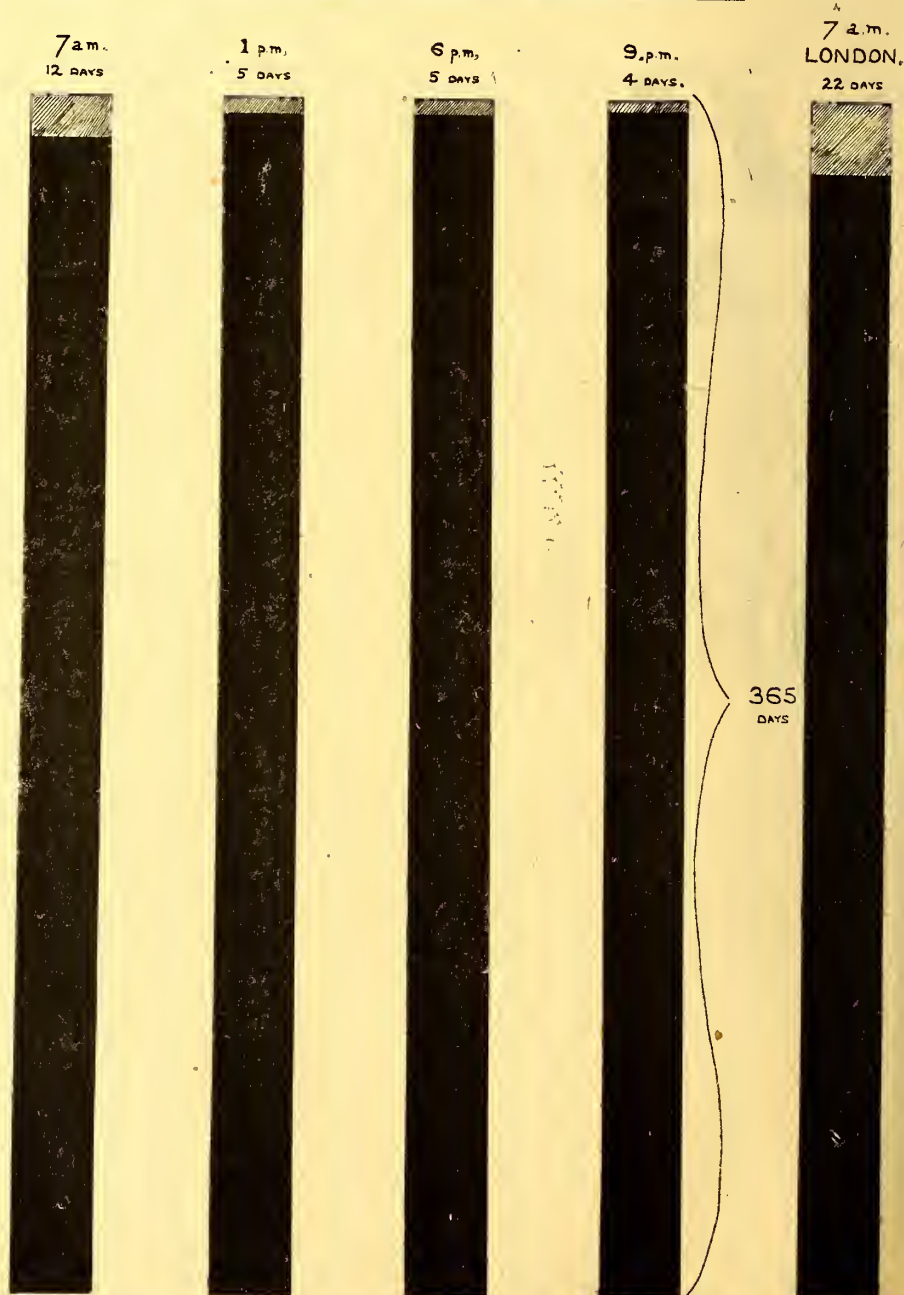
FOG. SOUTH COAST (OMITTING SCILLY) N^o OF DAYS PER ANNUM.

Fig. L.—Fog Chart, showing foggy days on the South Coast during a recent year.

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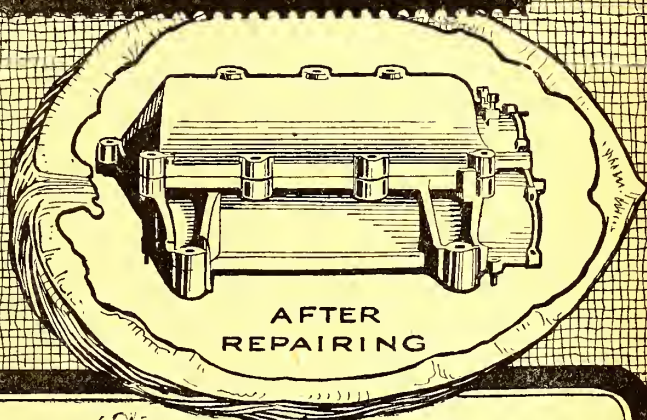
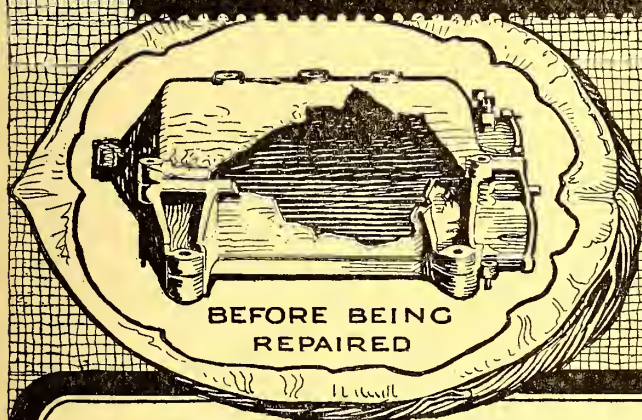
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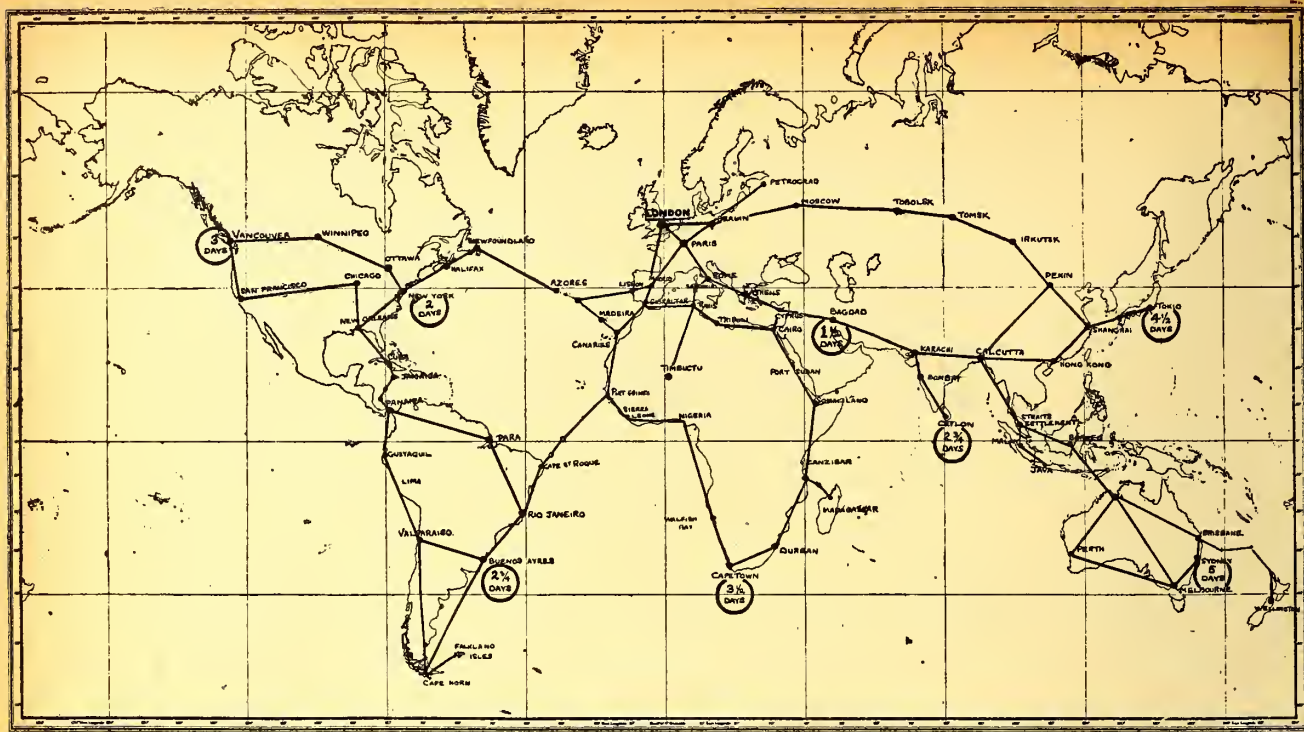
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A Map of the World, showing the obvious Air Lines to the different parts of the Globe.

days at the cost of £1 per letter. This really is very much the system of an Aeroplane Mail, but at a commercial rate and enormous speed. The riders galloped night and day, winter and summer, 10 miles stages, using a fresh pony for every stage. They were apparently, even in those days, streamlined; that is to say, the mail packets were fitted to the rider's body. Again, like an aeroplane, they carried no extra weight, they used a racing saddle, and wore light shoes, or none at all. The letters were written on paper as thin as gold-leaf, and thus bulk and weight were economised. Eighty pony riders were in the saddle night and day, stretched in a long procession from Missouri to California, forty flying eastward and forty westward, and using amongst them four hundred ponies. So will the Aeroplane Mail soon traverse the world in stages, some being stations, others being passed over.

I will presume that you have now accepted this principle, and I now propose to show you a map of the world, on which I have shown routes which you assume will be covered with 10-mile landing grounds. Once assuming that, I believe you will accept my previous figures on commercial aeronautics as a perfectly feasible proposition. You will see then what an enormous thing commercial aeronautics represents, and what a revolution in speedy transit. Ceylon becomes $2\frac{3}{4}$ days from London, Tokio $4\frac{1}{2}$ days, Sydney 5 days, Cape Town $3\frac{1}{2}$ days, Vancouver 3 days, and so on; and once you have accepted the premises on which I started, you will admit that I am only putting before you propositions which are perfectly easy to carry out.

It should be particularly noted that Germany cannot reach any part of the world outside her Allies without crossing the territory of our Allies, so that we and our Allies can close the world's aerial traffic to Germany if we so desire after the war.

You will see on this map that I have marked Timbuctoo, which sounds the most improbable place that anybody would wish to arrive at, but strange to say it is one of the places where an aerial service is already projected by the French Government, which really affords a very good instance of the use of the aeroplane. At the present moment it takes three to four months from Bordeaux to Timbuctoo, and owing to this the many officers employed spend half their time going and coming. The cost of this journey at present is £120, and it is estimated by a friend of mine in the French Government, who has given me this plan, that it could be done by aeroplane for £100 per journey, and taking it by easy stages it would only be a matter of days instead of months.

Instances in the Overseas Dominions, where not yet developed, we shall find in hundreds, where the aeroplane can be used, but I show you in Fig. N, as an example, a map of Australia, showing you the railways marked on it. You will see that an aeroplane service on each side of any of these lines of 50 to 100 miles would certainly mean the establishment of a great many small townships, which eventually, when big enough, will of course, have their railway. This, coming down to pounds, shillings and pence, presents an absolutely commercial aspect, as shown on the map. A passenger from the township to the rail-

way, or *vice versa*, can be carried profitably at fourpence per mile, which is a little more than first class fare in this country. Mails and goods can be delivered at $2\frac{1}{2}$ d. per lb., and this applies to all the Overseas Dominions.

One point I should like to disabuse everyone on at once is the discomfort of an aeroplane. At the present time it is not, of course, suited for carrying a large number of passengers, but I have gone carefully into this problem with my drawing office, and allowing for the reduction in speed the alterations will necessarily make, we find that it is perfectly easy to design a comfortable cabin in which passengers would be quite as much at their ease as by any other method of transit. When, therefore, you come to the discomfort of a shaky train, the dirt, and the annoyance of changing from train to boat and boat to train, etc., you will find that the comfort of the aeroplane is easily superior to the discomforts one goes through on an ordinary journey to-day. You will later on, on the cinema films, see the interior of a big Porte Boat, built by my company, and you will see that already we have a machine which has a commodious cabin.

WAR DEMANDS.

Now I should like to explain that my figures and my fancies this evening have been based on present-day machines, but we must take into account that the aeroplane has only really been encouraged since war began and for war purposes. It is therefore fair to assume that the aeroplane has developed along entirely wrong lines from a commercial point of view, and the present design is wrong (thinking commercially) for the following various reasons:—

1. Excessive climb demanded in a fighting machine, and power thrown away to obtain this.
2. Excessive attention devoted to visibility, gun positions, etc.
3. Excessive strength for fighting manoeuvres, etc.


The present unpleasant features of an aeroplane, i.e., noise, oscillation, cold, cramped positions, are all due to war design, and can all be eliminated in a passenger-carrying aeroplane without reducing this speed very much, but only by sacrificing climb, visibility, guns, etc.

HISTORIC PRECEDENT.

In criticising the cost of running an aeroplane service and comparing it with train service or ships, one ought to consider how very unpractical and useless the first trains or ships were, and how exceedingly unpleasant travelling in them must have been. Passengers in the first train, I believe, were just as cramped as they are to-day in an aeroplane. The oscillation was greater, they were covered with smoke and cinders, and the speed was limited to the rate at which a man could walk in front with a bell.

The early ships were equally unstable, and it was a very doubtful point when a ship set out if it would arrive at its destination, if ever.

If one reads any of the accounts of the early voyages one is struck by the fact that very frequently they set out from a place and returned six months later, having met adverse weather,

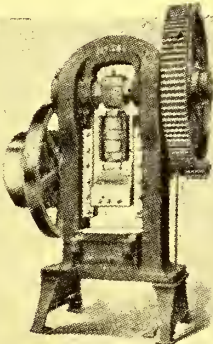


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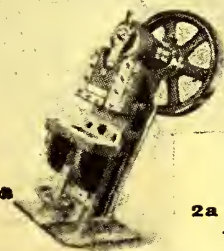

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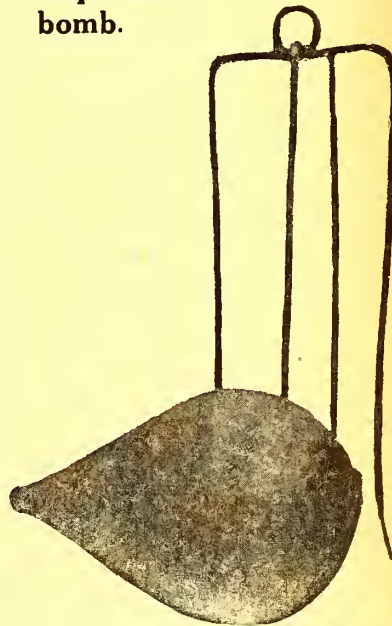
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and it was the custom to say Masses for anybody who thought of doing anything so hazardous as going a sea voyage.

The safety of the present steamship transit, I would submit, is due in the first place to engine development; also to the fact that every country has spent millions of money in harbours, lighthouses, docks, shipyards, etc., etc., and for an aeroplane service exactly the same steps will have to be gone through to ensure success for the commercial aeroplane.

Looking a great deal ahead one point occurs, i.e., that the geography of the upper air is at present quite unknown, and assuming the large aeroplane comes into use with reliable, powerful, and compact engines, it is reasonable to suggest that steady air currents, etc., may be found which will enable the trip to be made at a much greater speed and with much greater power than is at present even thought of and consequently much greater economy.

Now all I have been able to do to-night is to give you something to think over, something to digest; but I hope I have proved that flying has come to stay, and must from an Imperial point of view be supported in every way. Mail services, as I have shown you, can be established commercially; business men can use the aeroplane commercially for many purposes, and for pleasure nothing can beat it. I have arranged a somewhat imaginative cinema film showing you something of what an aerial service will look like, and the last thing I have to say is this. Remember that we live on an island, remember that we have always depended on the sea for our protection, and last but not least, remember that we are an Empire. On all these points it is necessary to maintain a huge aerial fleet, and the proper support of commercial aeronautics will enormously assist these ends. *This time we must be first.*

THE FILMS.

Hereafter Mr. Holt Thomas exhibited some most interesting films showing a Handley Page biplane as a cross-country passenger-carrier on a big scale. These were followed by further films showing the running of a postal service by fast war machines. And these again were followed by an exhibition of films of huge flying-boats used for over-sea traffic. The films were excellently arranged and very convincing, even to the most sceptical.

COMMENTS BY THE AUDIENCE.

LORD COWDRAY having warned those who wished to take part in the discussion that their speeches must be limited to five minutes in length, LIEUTENANT-COLONEL MERVYN O'GORMAN, C.B., who was the first to speak, remarked that it was difficult in five minutes to deal with a subject which even Mr. Holt Thomas had been only able to sketch in an hour. He congratulated Mr. Holt Thomas on his foresight and good fortune, and recalled that when in 1909 he went to the first great Reims meeting with Mr. Holt Thomas, they agreed to keep a careful account of their expenses. Thereafter, Mr. Holt Thomas offered to toss him for the amount of the two hotel bills and won on that as on other occasions. Colonel O'Gorman agreed that speed is the fundamental basis of success in commercial aeronautics. Speed is equally important in installing a commercial organisation for operation after the war to replace the present war activity of the Aircraft Industry. He stated that he thinks that landing grounds will cost less than £250 per annum, as estimated by Mr. Holt Thomas, and he remarked that it is now some four years since he was asked by a big engineering firm to organise a big aeroplane service down one of our big rivers.

SIR JOHN REES, M.P., who spoke with the true political manner, said that Mr. Holt Thomas' promise of a two-day journey to Bagdad seemed to him like the magic carpet of the Arabian Nights. He hopes that the development of commercial aeronautics will not be met by a spirit of obstruction, similar to that with which another trade corporation proposition was met recently in the House of Commons. Mr. Lloyd George, on whose accuracy of statement we can surely rely as Prime Minister, had said that we are always too late, and he hoped we will not continue to be so.

Speaking with diffidence before so many experts, he said that there is reason to believe that we were rather late in developing our Air Services, and he hopes we will not be too late in our commercial war. He further remarked how often it will be possible to avert financial difficulties by one of these rapid journeys indicated by Mr. Holt Thomas. One presumes that Sir John Rees has views of sending a broker's man by special aeroplane to some defaulting Oriental debtor.



The Map of Australia, showing existing Railway Lines, and the room left for Air Lines.

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MR. HANDLEY PAGE said that while listening to Mr. Holt Thomas we must all have felt as the Spanish Court felt when Columbus, egg in hand, explained how easy it was to cross the Atlantic. Mr. Page did not state whether, under the circumstances, the egg was a threat or a promise. He pointed out that for passenger transport to become popular the question of sociability and comfort must be studied. Flying a small fighting machine must be rather like riding a fast motor bicycle, and waiting for the wheels to come off and land one in a ditch. He thought that the photographs shown of the cabins in the big flying boats illustrated the comfort that can be assured in big aeroplanes, and he said that he hopes to see very much bigger machines in use than those of to-day.

MR. H. WHITE SMITH, Chairman of the Society of British Aircraft Constructors, emphasised the fact that support must be given by the Government to commercial aeronautics after the war, so as to assure the welfare of a strong industry which will enable this country to secure its share of the world's air traffic.

BRIGADIER-GENERAL BRANCKER, Deputy-Director-General of Military Aeronautics, said that he agreed with everything said by previous speakers, except the statement that the qualifications now required for war machines will not be needed in peace time. On the contrary, he believed that we have excellent opportunities of making preparations for peace and war go hand in hand.

For example, the big bombing machines of to-day are precisely those required for long distance traffic and mail traffic. The ordinary reconnaissance machines used for the routine work of the Army are of precisely the type required for ordinary domestic use. The Military fighting machines with their capability for acrobatic flying are equally of the type which will be used for racing and for display flying.

One cordially agrees with General Brancker on these points, except for the minor matter that it is to be hoped that there will be very much less display flying after the war than there was before, and that aeroplane racing will be taken seriously, and will not be mixed up with acrobatics any more than horse racing is mixed up with circus performances. We have, in fact, had rather too much acrobatic flying on the part of young and inexperienced R.F.C. officers during the last few weeks. Also as regards machines for domestic use, one trusts that General Brancker had not in mind the use of R.E.8s as culinary utensils for the frying of whole families instead of merely the cooking of individual aviators.

Continuing, General Brancker emphasised the point that it is our task in the future to make war and peace aeroplanes fulfil one another's purposes as far as possible. He was of the opinion that Mr. Holt Thomas had not quite brought out the expenditure to be expected in blood and money before actual commercial success is attained. He stated that after the war it may be possible to cut down some of the extreme demands now made on war machines, and to concentrate our efforts on the reliability of machines to increase the safety of flying, and if this is done we shall not want landing places every ten miles, as Mr. Holt Thomas estimated.

LORD MONTAGU OF BEAULIEU, whose return from India will be welcomed by all who recognise the good service he has done to

aeronautics in this country, stated that in a certain part of India where trouble is frequent landing places for aeroplanes have already been established at regular distances of fifteen miles instead of ten, and that they operate quite satisfactorily.

He emphasised the fact that but for the war we should not have progressed half as fast as we have done in the development of aeroplanes. He estimated that progress has been accelerated by something like thirty years, and he bore witness to the great debt that this country owes to the pilots of the R.N.A.S. and R.F.C. in helping on the development in aeroplanes. In complimenting Mr. Holt Thomas on his lecture, he commented on the remarkable way in which the lecturer combined imagination with great knowledge of practical detail.

LORD COWDRAY'S ENDORSEMENT.

LORD COWDRAY, in thanking Mr. Holt Thomas for his lecture, congratulated him on the way in which all the speakers had agreed with him. He remarked that no one disguises the difficulties of commercial aeronautics, and referred to one speaker's remark that there will probably be a hiatus between the outbreak of peace and the organisation of commercial aeronautics. Lord Cowdray said that it will be impossible to expect to keep the Aircraft Industry at its present high pressure after the war, and that, consequently, the Aircraft Industry ought to be specially favoured by the tax-gatherer when he comes to collect war profits. He said that after the war there will be thousands of pilots and mechanics who have been carefully trained and who are proved worthy thrown out of work. It is essential that they and their knowledge shall be used.

Continuing, he said that it will be found that Mr. Holt Thomas' estimates as to cost are somewhere very near the mark, and that the cost of running passenger machines will not be above 5s. a mile. Even at that price the Government ought to help passenger lines, and allow a fair profit to the proprietors of those lines. Where in the past Mercantile Marine has connected nations, commercial aviation will bind them together, and he said that he could not express too strongly his endorsement of Mr. Holt Thomas' views on the future of commercial aeronautics.

Flying, he said, will enable us to do so much more in our time in the future. He congratulated Mr. Holt Thomas on the care taken in preparing the lecture, which lecture would have been impossible without great experience, and he concluded by saying that he had heard Mr. Holt Thomas spoken of as the Napoleon of the Aircraft Industry.

LIEUTENANT-GENERAL SIR DAVID HENDERSON, K.C.B., D.S.O., Director-General of Military Aeronautics, expressed the thanks of the Aeronautical Society to Lord Cowdray, and said that Lord Cowdray had made a good start as a member of the Aeronautical Society in presiding over the largest meeting the Society had ever held. He concluded by remarking that the meetings of the Aeronautical Society are the only place where people talk sense about aeronautics. Without entirely agreeing with General Henderson on this point, one may admit that one has long had misgivings about the Hotel Cecil, where, possibly, he formed the opinion cited.—C. G. G.

THE BOMBING OF NEUTRAL TOWNS BY UNKNOWN AVIATORS.

An official statement issued through the Press says:—

Exhaustive inquiries made by the Government have proved conclusively that it is out of the question that the bombs dropped on the Dutch town of Zierikzee on April 29th-30th could have been dropped by any British aircraft.

The only British aircraft which might conceivably have been concerned, says Reuter, were two naval aeroplanes which left the vicinity of Dunkirk on the night in question in order to attack Zeebrugge mole, over which they dropped 16 bombs. Both machines took the same time, within 14 minutes of each other, to reach their objective and return to their base. Both were slow machines, and there was an adverse north-east wind of about 20 miles an hour velocity. The time taken by both to carry out the attack on Zeebrugge and to return makes it quite impossible that either of them could have got so far east as Zierikzee, even had it been possible that their pilots could have mistaken the well-known objective of Zeebrugge.

Each machine carried eight bombs. A German communiqué, issued later and reproduced in the Dutch Press, stated that on this night 15 bombs were dropped by British aircraft and fell into the water in proximity to German naval vessels at Zeebrugge. Neither of the British machines carried any searchlights, star shells, or other ground-illuminating apparatus. The machine which bombed Zierikzee is reported to have operated with searchlights.

As regards the marking of the parts of bombs picked up by the Dutch authorities at Zierikzee, certain markings can be recognised probably as British in imitations of British marks; others cannot be identified and have no resemblance whatever to any known British markings. The Government have informed the Netherlands Government to this effect.

It is worthy of note:—

(1) That on the night of May 3rd-4th British aeroplanes operating near the Belgian coast reported having observed an aeroplane (presumably enemy) near La Panne, which was carrying a powerful light.

(2) That in November last a false statement that British aircraft had dropped bombs at Rheinfelden, in Swiss territory, was published by the "Strassburger Post." It was affirmed that the bombs were of British manufacture. It happened, however, that no damage was done, and no recognisable fragments were picked up, and consequently the purpose of the German Government (which was no doubt to embroil Great Britain and Switzerland) was not effected. Shortly before that occurrence the Germans had captured a British aeroplane carrying bombs.

(3) That German aircraft of all descriptions have repeatedly and for many months manoeuvred over Dutch territory, and on at least one occasion dropped objects on to Dutch territory.

(4) That the armed forces of the German Government have shown little, if any, respect for the lives or property of neutrals, as is universally proved by the deliberate sinking of neutral vessels of all nationalities and the murder of defenceless neutral subjects.

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IN THE HANDS OF THE ENEMY.

THE AEROPLANE'S Danish correspondent writes:—

The German list of 27 British and 12 French aeroplanes captured in Nov., 1916, adding the comment that 50 aeroplanes were undisputedly shot down, and one forced to land behind the hostile lines, against which figure of aeroplane losses of 20 for the month stand the German one of 27 lost in front of and behind the fighting line.

BRITISH AEROPLANES.

1. Vickers single-seater; Nr. 7010. Passenger: Capt. Pemberton.
2. Vickers single-seater; Nr. 6409. Passenger: Lieut. Cock.
3. Vickers single-seater; Nr. 2543. Passenger: Lieut. Evans.
4. Vickers single-seater; Nr. 7925. Passenger: Lieut. Curlew.
5. Vickers single-seater; Nr. 400. Passenger: Capt. Bolton.
6. Vickers single-seater; Nr. 2607. Passenger: Henry Arthur Hallon.
7. Vickers single-seater; Nr. ?. Passenger: Lieut. Georg Doughty.
8. Vickers single-seater; Nr. ?. Passenger: Lieut. Gilbert Stabb.
9. Vickers single-seater; Nr. ?. Passenger: Lieut. Robert Corbeth.
10. Vickers single-seater; Nr. ?. Passenger: Major Hawker.
11. F.E. single-seater; Nr. 7642. Passenger: Capt. Mattleback (? Mapplebeck).
12. F.E. single-seater; Nr. 6454. Passenger: Lieut. Dan.
- 13, 14, 15. F.E.s; Nrs. ?. The names of the passengers unascertainable owing to the aeroplanes being destroyed by fire, smash, or direct hit.
16. B.E.; Nr. 2508. Passenger: Lieut. Knight.
17. B.E.; Nr. 2506. Passenger: Sub-Lieut. K. Cameron.
18. B.E.; Nr. 4019. Passenger: Lieut. Th. Clarke.
19. B.E.; Nr. ?. Passenger: Lieut. B. W. Blainey.
20. Sopwith; Nr. 2677. Passenger: Lieut. Neill.
21. Sopwith; Nr. 1903. Passenger: Sergt. Robert Evans.
22. Sopwith; Nr. 5190. Passenger: Lieut. W. Bertram Glad.
23. Sopwith; Nr. 5947. Passenger: ?.
24. Nieuport single-seater; Nr. 17125. Passenger: Lieut. Spencer.
25. Nieuport single-seater; Nr. 1697. Passenger: Sergt. Roxas Elias.
26. ?; single-seater; Nr. A2777/1794. Passenger: Sub-Lieut. W. C. Crawford.
27. Type ?; Nr. ?; Passenger: ?.

FRENCH AVIONS.

28. Nieuport; Nr. 1864. Passenger: Adj. Raoul Monzoreau.
29. Nieuport; Nr. 1746. Passenger: Sergt. Ka-stuer.
30. Nieuport; Nr. 1797. Passenger: ?.
31. Caudron two-seater; Type 6; Nr. 1636/839. Passengers: Sub-Lieut. Jules Leleu, Sub-Lieut. Leon Guedon.
32. Caudron two-seater; Nr. ?. Passengers: Sub-officers Desprat and Roger Girard.
33. Caudron; Nr. ?. Passenger: Sergt. Robert Laguesse.
34. Farman two-seater; Nr. 2434. Passenger: Lieut. Pierre Sond; and five others unknown as to numbers and passengers.

* * *

The air fights have reached a higher extent in March, 1917, than ever before, and even the Germans confess higher losses, approaching the given figures of the Allies, than at any other time. For in deducting the 99 aeroplanes, the German communiqué of April 8th gives, as brought down on the Allies' own ground, from the total figure of 161 aircraft stated with 19 Allied kite-balloons lost against no German ones, the aerial losses stand with 45 confessed German aeroplane losses against 62 French, English and Russian aeroplanes, the list of which is given below.

BRITISH AEROPLANES.

1. Sopwith two-seater; Nr. A1111. Passengers: P. H. Lowndes; the name of the second passenger unknown.
2. Sopwith two-seater; Nr. 4594. The passengers killed.
3. Sopwith two-seater; Nr. A1108. Passengers: Lieut. W. Reid, Lieut. H. J. Green.
4. Sopwith two-seater; Nr. 4168. The pilot killed, the observer severe wounded.
5. Sopwith two-seater; Nr. 1907. The passengers taken prisoners.
6. Sopwith two-seater; Nr. ?. Aircraft and passengers burnt complete.
7. Sopwith two-seater; Nr. 5784. The passengers wounded and prisoners.
8. Sopwith two-seater; Le Rhône engine; Nr. 2637. The passengers killed.
9. Sopwith two-seater; Nr. 7763. Passengers: Lieut. Charles Stuart Vane Tempel, Lieut. Allinson.
10. Sopwith two-seater; Nr. ?. Passengers: Capt. Stuart, Lieut. Duff.
11. Sopwith single-seater; Nr. A633. Passenger: Capt. ?, severe wounded.

12. Sopwith single-seater; Nr. 6170. The pilot killed.
13. Sopwith single-seater; Nr. 6165. The pilot killed.
14. Sopwith two-seater; Nr. 6633. The names of the passengers unascertainable.
15. Vickers two-seater; Nr. 1935. Passengers: Capt. William S. R. Blomfield, Sub-Lieut. Victor O. Landsdale.
16. Vickers two-seater; Nr. A5443. The passengers taken prisoners.
17. Vickers two-seater; Nr. ?. One passenger killed, one severe wounded.
18. Vickers two-seater; Nr. 1948. Passengers: Lieut. F. E. Bille, Lieut. A. G. Ryall.
19. Vickers two-seater; Nr. 5439. The passengers killed.
20. Vickers two-seater; Nr. ?. Passengers: Lieut. Knight; the name of the other passenger unknown.
21. Vickers single-seater; Nr. 7941. Passenger: Capt. H. C. Southon.
22. Vickers single-seater; Nr. 7882. Passenger: Lieut. J. M. Montembault.
23. Vickers single-seater; Nr. 3425. The pilot burnt (A. M. G.).
24. Vickers single-seater; Nr. 4874. Passenger: Sub-Lieut. G. J. Hasde.
25. B.E. two-seater; Nr. 12205. The passengers burnt.
26. B.E. two-seater; Nr. 5856. Passengers: Lieut. A. E. Watts, Lieut. C. Underwood.
27. B.E. two-seater; Nr. 5179. Passengers: Sub-officer Cooper, Lieut. Appleton.
28. B.E. two-seater; Nr. 6232. Passengers: Lieut. Byrne, Lieut. Smith.
29. B.E. two-seater; Nr. A27. Passengers: First Lieut. Wildon Anderson, First Lieut. Duncan Boyd Wolley.
30. B.E. single-seater; Nr. 2560. The pilot taken prisoner.
31. F.E. two-seater; Nr. 4830. The passengers taken prisoners.
32. F.E. two-seater; Nr. 464. Passengers: Lieut. A. R. Schumm, Lieut. E. C. Coops.
33. F.E. two-seater; Nr. ?. The names of the passengers unascertainable.
34. F.E. two-seater; Nr. ?. The names of the passengers unascertainable.
35. F.E. single-seater; Nr. 6397. Passenger: Sub-Lieut. W. B. Bill (? Bell).
36. F.E. single-seater; Nr. 6456. Passenger: First Lieut. Shepard.
37. Nieuport single-seater; Nr. A259. Passenger: Lieut. A. Whitthard.
38. Nieuport single-seater; Nr. 6615. Passenger: Lieut. Hugh Welch.
39. Spad single-seater; Nr. A6633. Passenger: Lieut. Parves.
40. Spad single-seater; Nr. 6607. Passenger: Lieut. Baker.
41. Martinsyde single-seater; Nr. 7508. Passenger: Sub-Lieut. Webster.
42. Type ?; two-seater; Rotary motor; R35068. Passengers: Capt. Lees, Bix; the latter's rank unknown.

FRENCH AVIONS.

43. Nieuport single-seater; Nr. 2283. Passenger: Sub-officer Maurice Doat.
44. Nieuport single-seater; Nr. ?. The pilot killed.
45. Nieuport single-seater; Nr. ?. The pilot killed.
46. Nieuport single-seater; Nr. ?. The pilot killed.
47. Nieuport single-seater; Nr. 2341. Passenger: Lieut. Mans.
48. Nieuport single-seater; Nr. 2277. Passenger: Sub-Lieut. Raymond Havet.
49. Nieuport single-seater; Nr. 3418. Passenger: Sergt. Truscot.
50. Nieuport single-seater; Nr. ?. The name of the pilot unascertainable.
51. Caudron two-seater; Engines: 2 le Rhône; Nrs. 1408 and 2199. Passengers: Sub-Lt. Le Mevel; name of Sergt. unknown.
52. Caudron two-seater; Nr. G. IV. 2217, 5.16. Passengers: First Lieut. Menod Ducimetiere, Lieut. Conetoux.
53. Sopwith single seater; Nr. 5143. Passenger: Sergt. Louis Pivet.
54. Sopwith two-seater; Nr. ?. Passengers: Adj. Robin, Lieut. Barbot.
55. Spad single-seater; Nr. ?. Passenger: Lieut. Le Denil.
56. Voisin single-seater; motor: Renault; Nr. 60249; Passenger: Lieut. Litau.
57. Farman two-seater; Nr. 4100. The passengers killed.
58. Tractor-biplane, single-seater; Nr. ?. The aircraft burnt.

ON THE EASTERN AND SOUTH-EASTERN FRONTS.

59. Nieuport two-seater; Nr. 3182. Passengers: Lieut. Sidney George Beare, Lieut. Edgar Peary Hyde.
60. Morane (Parasol type) two-seater; Nr. 317. Passengers: Staff Capt. Lezowski, Sub-officer Gussjen.
61. Sopwith two-seater; Nr. 5223. Two British naval men, both killed.
62. Type ?; single-seater; Nr. 250. Passenger: Lieut. Glasson.

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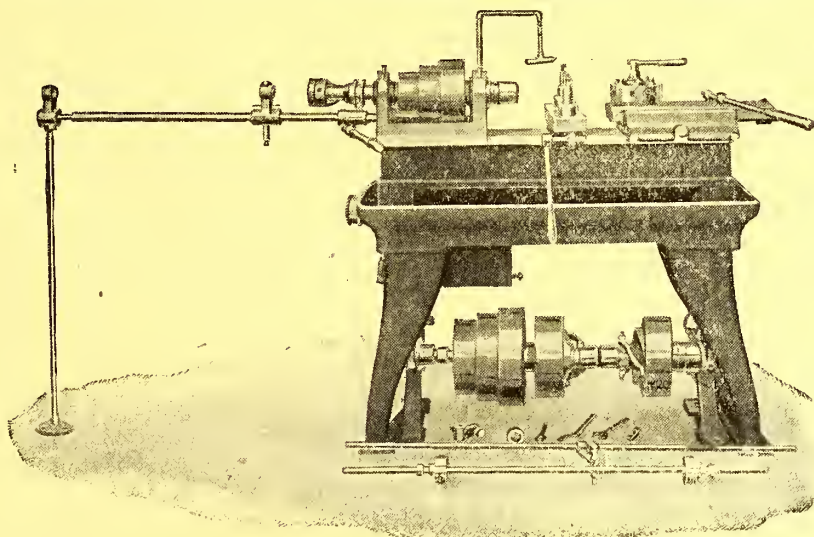
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COMPARATIVE LOSSES.

The following account is taken from the "Times" of June 2nd: Seven hundred and thirteen aeroplanes were brought down on the Western battle front during May, only four less than in April, when the struggle for superiority in the air reached its maximum intensity.

In this period the Germans lost 442 machines, and the Allies, according to the claims of the enemy, 271. It is impossible to resist the conclusion that the air reports of German Main Headquarters are, like their military communiqués, exaggerated, even when they are not quite false. Our General Headquarters in France, the only one of the belligerents which acknowledges its own losses, admits that during May 86 British aeroplanes failed to return to their base. Deducting this figure from the German total, it would mean, if it is accurate and does not include, as the enemy's monthly summary frequently does, machines brought down on the Eastern and Balkan fronts, that the French Air Service has lost 185 aeroplanes, or nearly twice as many as their comrades in the Royal Flying Corps.

But taking the figures as they are, they show that the Germans lost 73 more machines last month than in April, that our losses were 61 fewer, and that those of the French were 16 more. British airmen and gunners claim 243 of the 442 German machines and the French the other 199.

The British successes were classified in the daily reports from General Headquarters as follows:—Destroyed, 19; crashed, two; brought down (which, as in the case of the French, means destroyed), 91; fell in our lines, nine; brought down by anti-aircraft guns, nine; driven down out of control, 113.

The French Ministry of War states, without any qualification, that of the German machines brought down by French aviators 85 were destroyed. "Their destruction," it was reported, "has been most strictly verified." The other 119 were driven down seriously damaged, "and probably crashed to the ground in the enemy's lines."

As in previous months, the German reports for May have not always distinguished between aviators' and gunners' successes. In the case of 165 machines, it was stated that they were brought or shot down in air fights; 55 others were attributed to aviators and gunfire; 37 were reported merely as "shot down," 12 as brought down by gunfire, and two "forced to land."

The most interesting personal item concerning the German Air Service is the complete disappearance from the official reports of Cavalry Captain Baron von Richthofen. This aviator was the commander of a squadron which is known at the front as Richthofen's "Circus," and he and it have been credited with quite dazzling performances. Richthofen was sprung upon the public on February 15th as the victor in 21 air fights, and between that date and April 30th (on which day he is said to have brought down five enemy machines) he was reported to have accounted for 31 other aeroplanes. Since April 30th, however, his name has not appeared once in the German reports. But the name of another Richthofen—a lieutenant—has figured in the reports since May 7th, and it is claimed for him that he has brought down 24 machines.

[Captain Baron von Richthofen is said to have been killed. One account says that he was killed in a collision, either with a German or a British machine. Another account, which is a pure rumour, says that he was shot down by a British aviator, said to be Captain Ball, and that his brother, Lieutenant Baron von Richthofen, mentioned above, promptly shot Captain Ball, whose body, in a burnt S.E.5., was found on the British side of the firing-line.]

It must be remembered, in studying these figures, that the British figures take no account of such of our machines as are shot down behind our own lines, nor of pilots put out of action in landing. Therefore, the figures are not really comparable, and are only of use for purposes of comparing our bag of Germans in one month with that of another month, or our list of missing one month with the missing of another month.—Ed.]

THE FIRST BIG AEROPLANE RAID.

On May 29th an inquest was held at Folkestone upon the bodies of those killed in the town during the German aeroplane raid on May 26th. In all, thirty-three cases were investigated.

The jury, after consultation in private, returned a verdict that the deceased persons met their deaths by injuries received through bombs from hostile aircraft, Great Britain being in a state of war, and the victims being at the time non-combatants.

A rider was added regretting that the competent authorities did not give notice of the approach of aircraft, and stating that the jury were also strongly of opinion that in future the town should be warned by sirens or some other device.

An additional inquest was held at Folkestone on May 30th upon 34 cases, making 67 in all. The original verdict was returned in each case, a rider being added by the jury condemning in the strongest possible manner the negligence of the local and military authorities for not having made arrangements whereby the public could be warned.

At a crowded meeting on May 29th, at Folkestone, it was resolved that "The residents of the borough of Folkestone demand that the Government be asked immediately to hold an inquiry into the air raid on Friday last, May 25th, and to take such steps as will prevent further attacks of a similar nature and the wholesale murder of women and children of the town."

A deputation from the town and district of Folkestone interviewed Lord French, Field Marshal Commanding-in-Chief, Home Forces, on May 30th, with reference to the enemy air raid of May 25th. An official report states:—

"The object of the deputation was to obtain an assurance that the measures which had been, and would be, taken for the safety of the district were sufficient to afford adequate protection.

"Lord French, in reply, said that such experience as we had showed that it was not possible absolutely to prevent attacks by aeroplane; but that the scheme of defence had been very carefully considered in the past and had been reconsidered in the light of the experience gained in the recent raid. Even if it were not possible to prevent their coming, he hoped that the measures which had been taken would make any future raid a very risky operation and would ensure heavy loss on the enemy."

* * *

On May 30th a high official informed a representative of the "Daily Express" that

"It is certain that hereafter an entirely new and thorough system of notification will be introduced. We shall lose no time in applying it. The details are not yet fixed, but it will ensure that the whole of the coast towns, and possibly towns as far inland as London, shall be notified as soon as hostile aircraft are sighted over the land.

"Certain lights and alarms may be used at night, and other means will be adopted in the daytime. One system strongly favoured is the ringing of all telephones, public and private, by an arrangement now under consideration. People with telephones in their houses would be expected to communicate with neighbours not on the telephones.

"Previous to the Folkestone raid the inhabitants of towns might have complained of being unnecessarily alarmed if a warning were not succeeded by an attack. They will be less likely to complain now. The warning will enable them to take cover. Undoubtedly the death-roll at Folkestone must have been much lower if the streets had been empty.

"The public will be expected to act wisely and not to expose themselves by going out to scan the sky.

"Raids occurring while people are in their beds will need no notification, as there is no safer place than one's own house at such times of danger."

[All of which is very pretty. But it would be so much less trouble if the raids were prevented from starting by the simple process of making concentrations of enemy machines in Belgium impossible.—Ed.]

* * *

The Chief Constable of Essex has issued an official notice stating that, as there is always the possibility of an Essex town being the object of a hostile air raid by day, it has been arranged to notify the inhabitants in the principal centres of the approach of aircraft. The warning will consist of three short blasts of a siren followed by continuous blasts for 15 seconds, and this will be kept up for three minutes. All inhabitants are urged for their own safety to seek the nearest possible shelter as soon as the siren is sounded, and under no circumstances to congregate in the streets.

FROM DENMARK.

The latest German casualty lists of the aerial troops include the names:—Lieut. Baldamus, awarded the "Pour le mérite," with 18 victories, killed in collision with a hostile aeroplane; First Lieut. Bur, awarded the "Pour le mérite," with 9 victories and one kite-balloon, killed on April 6th in collision with another German aeroplane, the pilot of which was killed too; Flight Lieut. Frankl, awarded the "Pour le mérite," with 17 victories, killed in aerial engagement on Easter Sunday; Flight Lieut. von Kendell, awarded the "Pour le mérite," with 11 victories, missing since wounded in aerial fight on February 15th and died as prisoner; Lieut. Karl Haan, killed; Lieut. Edward von Marcard, killed in air fight.

* * *

The German aerial fighting forces have paid the late Prince Friedrich Karl of Prussia, whose body has been given back to Germany at the request of the Emperor, the following posthumous fame, their commanding General, von Hoepfner, signing: "A Hohenzoller has been killed as aviator! Unexpected Prince Friedrich Karl of Prussia has died from the severe wounds he received in aerial engagement, in English imprisonment on April 7th. With burning enthusiasm the prince devoted himself to the new Service in fighting for the German Fatherland and for the supremacy of the air. His high aviation ability, his pluck knowing of no difficulties let expect great successes for him in the air troops. Indurated by the hero's deaths of their best men the German air fighting forces fight on young and strong!"

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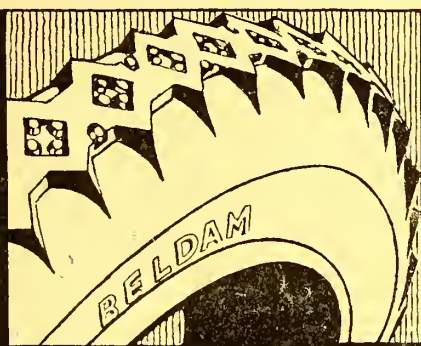
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A TESTIMONIAL.

General von Höppner, G.O.C. the German air forces, in an interview with a Dutch journalist, has declared that the German aviators have won supremacy over their enemies.

"The English," he said, "show in air fights that they are of the Germanic race, for they seek fight, and fight until either they or their opponents are killed. German aircraft generally are better than those of the enemy, though the new English Sopwith triplanes are excellent.

[Wait till he sees what is coming.—Ed.]

"The technical preparedness of the French is middling, and that of the British inferior. While we Germans consider every flight as a military act, for the British flying is but sport, and when it comes to a fight good sport. The German is a soldier first. Our German military training cannot be outdone by Britain's three years of waging war."

A report from Amsterdam, dated May 29th, says: General von Höppner, commanding the German forces, has given a Dutch news agency a long propagandist interview, glorifying German aviators and aircraft. He says that the enemy aircraft is far superior numerically on the Western front. Germany, however, is rather stronger on the Eastern front, while in the Balkans the proportion is again more favorable to the enemy.

German aircraft, General Hoepfner says, is superior to that of the Entente Powers, though they have, in the last few weeks, produced some machines almost equal to those of the Germans.

GERMAN AIR TRAFFIC.

It was announced a few days ago at Munich that a Government Air Traffic Bill is about to be presented to the Reichstag covering the measures already in preparation for the establishment of a "Central European Air Traffic System." It is stated that the Bill has been drawn up by "the International Air Traffic Company, Ltd.," and that the draught has already been submitted to all the Governments concerned.

It was reported from Berlin on June 2nd that the Aeronautical Club will establish a Zeppelin route between Hamburg and Constantinople, both for passenger and postal traffic.

The distance is 1,764 $\frac{3}{4}$ miles. There are to be 11 stations. The establishment of the route will cost 40 million marks.

THE SUNDERLAND AEROPLANE ACCIDENT.

An inquest was held on May 31st on the bodies of three men, one woman, and a boy, who were killed through an aeroplane falling on a crowd at the food economy meeting held at Southwick, Sunderland, on May 24th. Sec. Lieut. Philip Thompson, R.F.C., aged 19, said he had made 180 flights and had never had an accident before. He descended to see what the crowd was for, and, misjudging the distance owing to the sun being in his eyes, found that he was coming too low. He tried to reascend, but the left wing struck a flagstaff which he had not seen. He remembered nothing further. He was travelling about 100 miles an hour at the time with the wind. Several military officers testified to the capability and steadiness of the aviator. A verdict of accidental death was returned and Mr. Thompson was exonerated from blame.

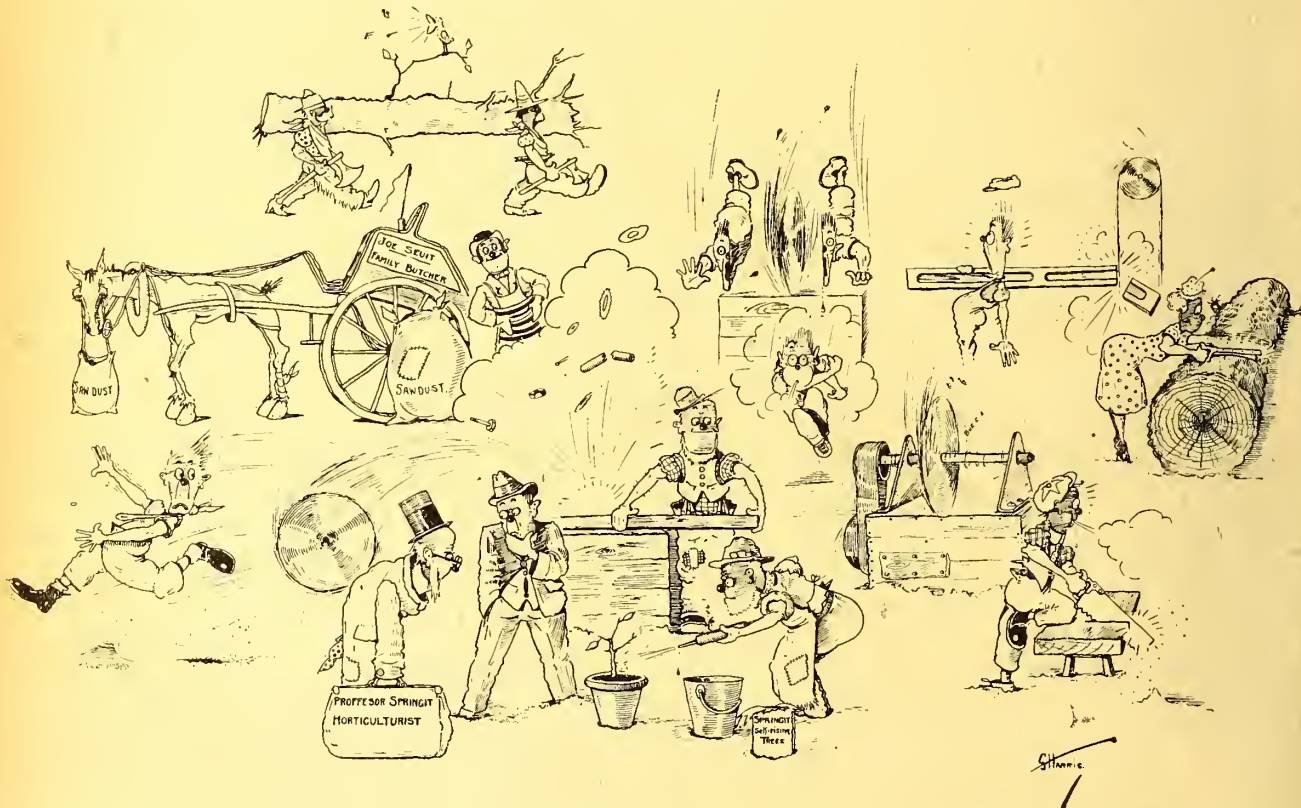
IS THAT SO?

The following extract from the "Daily Express" is not without interest :—

"An American aviation expert who has just returned from France says that he found in the French aerodromes a surprising complete knowledge of the science of aviation and a delightful readiness to give the Allied visitor the fullest information. The English aviator is, he says, equally expert, but infinitely more reticent. The American adds that this reticence is not the result of suspicion or of any desire not to be helpful. The Englishman is only characteristically fearful of allowing an American to discover that he really knows his job."

VOLUNTARY WAR WORK.

At the Air Board Office (the Hotel Cecil), where there are some 2,000 persons employed, arrangements for providing luncheon and tea for the staff are now being completed, and next week the rooms and kitchens will be opened. The Air Board Office Refreshment Club has for its object the provision of food and refreshments at reasonable rates, and accommodation has been provided for all ranks—from the chief to the messenger girl. The committee which is organising the club is appealing for voluntary waitresses, and ladies who are willing to give their services are asked to call at the Hotel Cecil between half past ten o'clock and midday and between three o'clock and six o'clock in the afternoon. No kitchen work is involved, only the care of plate and glass.



SCENES IN AN AIRCRAFT FACTORY.—No. XVII. THE SAW MILL.—In the foreground the works manager consults with a horticultural scientist as to the merits of accelerated growth of timber, in view of momentary scarcity. On the right an earnest worker saws a plank, oblivious of a vacant circular saw beside him. He is regarded with contempt by an old hand, who continues his work automatically, also oblivious of the fact that his saw has burst its bearings and is chasing a fellow-worker across the shop. In the centre background a careless fellow has fallen on his saw and has been neatly bisected in an expression of indignant surprise, while a butcher who has come to buy sawdust regards the work of the saw with professional envy, what time his war-rationed horse gazes on the world in pessimistic calm. The tragedy has surprised a worker on the right into spoiling a perfectly good spar in a band-saw, but the lady with the back-saw has not yet heard of the matter, and continues to work diligently. In the left background, fresh—very fresh—supplies are brought in by a couple of imported lumber-men, while the indigenous songster protests musically against the destruction of her home.

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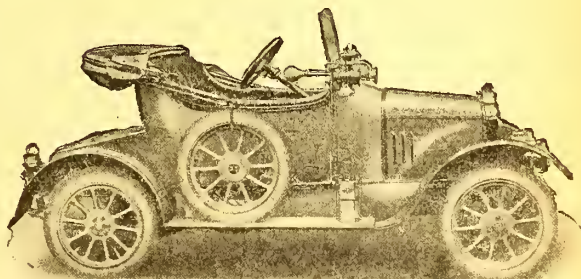


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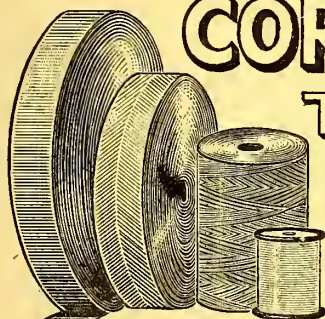
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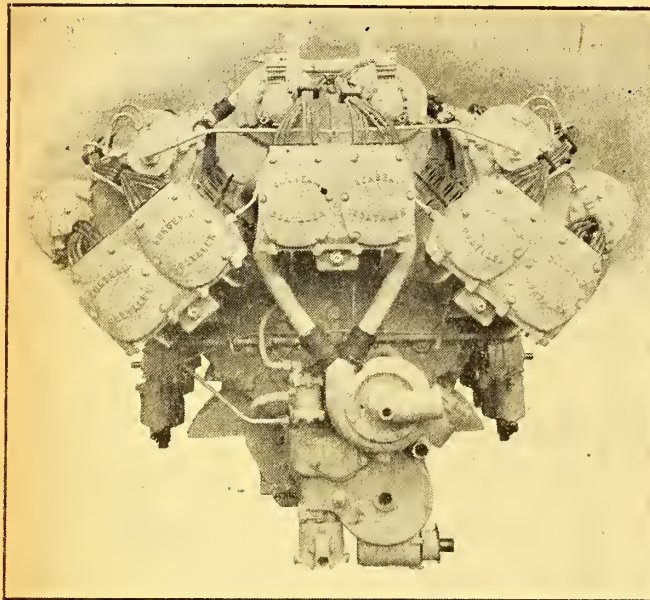
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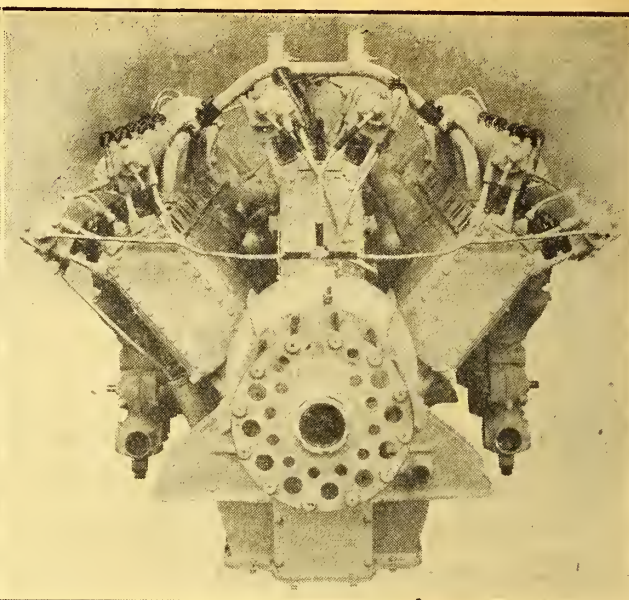


Magnetos End of the 18-Cylinder Sunbeam-Coatalen.

It may be recalled that a deal of public interest was manifested in the lecture delivered by Mr. Louis Coatalen on aircraft engine problems at the recent meeting of the Aeronautical Society of Great Britain. Of course, this was due to the fact that he is known both in this country and among our Allies as the engineer who has done most to evolve practical types of aircraft engines of high output for war service.

The Censorship has now passed for publication a few views of some of the latest Sunbeam-Coatalen aircraft engine types. These are interesting alike for the points they possess which may be of service to motor-car engine production in the future, and for the features in which they must always differ from that which is suitable for car practice.

As regards all the new types of engines, it will be observed from those illustrated that the crankcase and nose piece are cast in one, whereby there is achieved the dual gain of lightness and proportionately greater rigidity, to say nothing of accessibility and so forth. In these features such engines must always differ from motor-car practice.



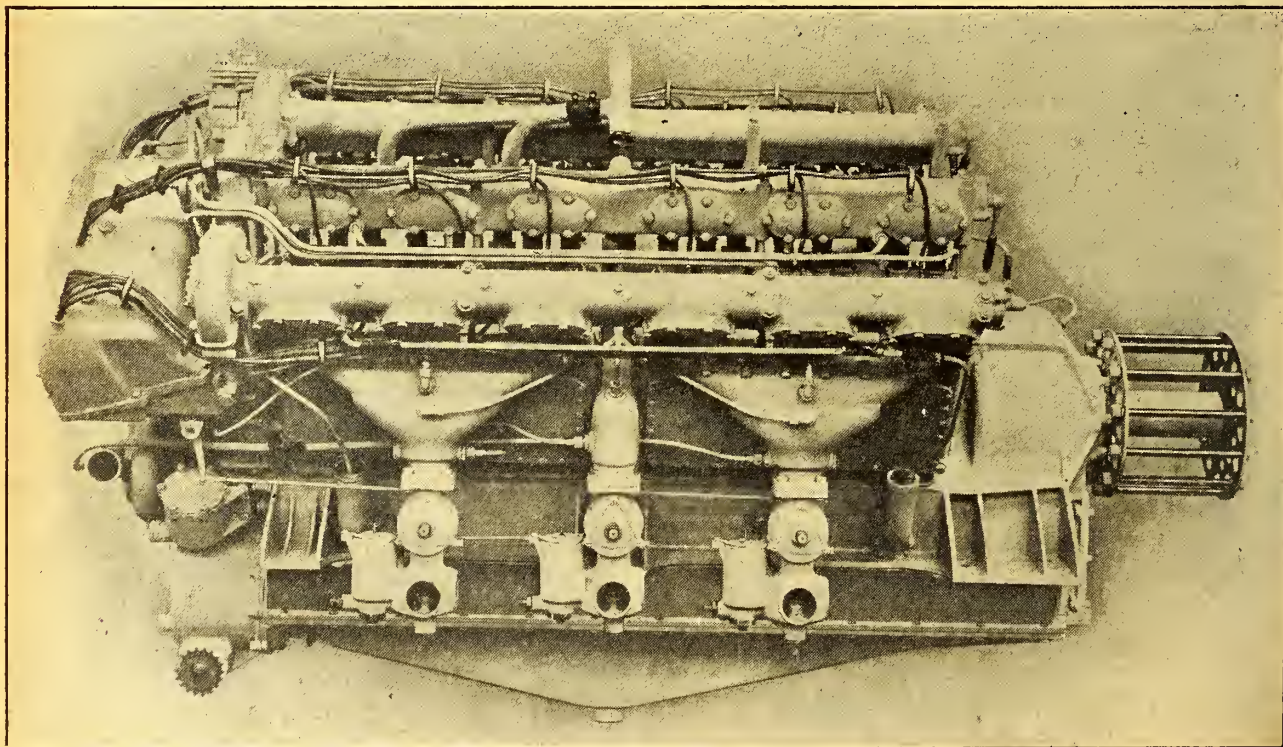
Propeller End of the 18-Cylinder Sunbeam-Coatalen.

Another point concerns the absence of flywheels.

The engine base, on the other hand, which is a dry sump in combination with a compound pump at the bottom, represents a scheme which may become a feature of standardised motor-car engine practice at some future period.

Every example of this series of Sunbeam-Coatalen aircraft engines has overhead valves on the principle of two inlet and two exhaust valves per cylinder, with the sparking plug set in practically the ideal position. The series of views illustrates the vertical, narrow type of engine, and the broad-arrow type wherein three rows, each of six cylinders, are set on a common crankcase. There is also a very handsome 12-cylinder V type of similar design.

In this water-cooled series the petrol and oil consumption is notably low, as is the weight per horse-power, particularly in face of the handicap under which British manufacturers have to work nowadays owing to the relative unreliability of magnetos.



Side View of the Three-Row 18-Cylinder Sunbeam Engine, known as the "Broad Arrow" Type.

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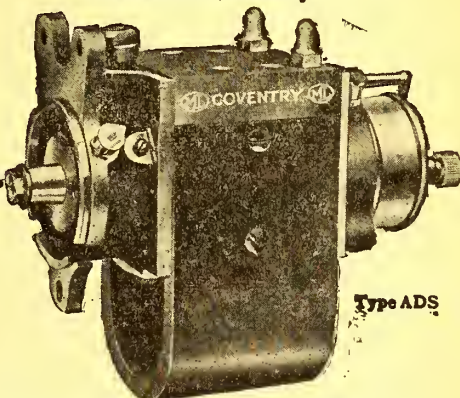
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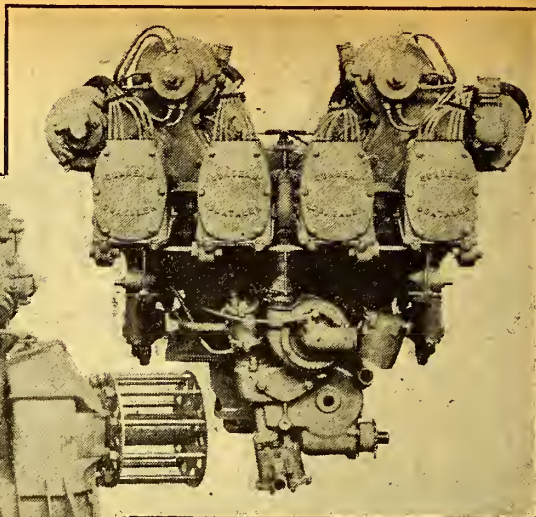
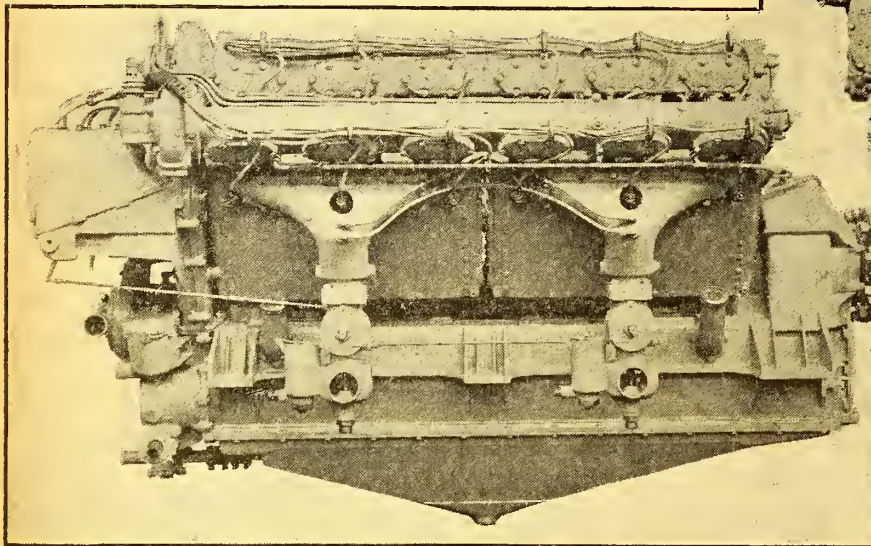


Type ADS

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Thus in regard to the 18-cylinder overhead valve Sunbeam-Coatalen aircraft engine of 475 brake horse power, there are no fewer than half a dozen magnetos. Each magneto is enclosed. Two sparks are furnished to each cylinder from independent magnetos. On this engine there are also six carburettors.

Shortness of crankshaft, therefore of engine length, and absence of vibration are achieved by the linking of the connecting



The 12-cylinder V-type Engine with cased-in magnetos and overhead valves. It is practically two rows of the 18-cylinder type.

rods. Those concerned with three cylinders in the broad-arrow formation work on one crankpin, the outer rods being linked to the central master one. In consequence of this arrangement the piston travel in the case of the central row of cylinders is 160 mm., while the stroke of the pistons of the cylinders set on either side is in each case 168 mm.

The duplicate ignition scheme also applies to the 12-cylinder 350 brake horse-power Sunbeam-Coatalen overhead valve aircraft engine type. It is distinguishable, incidentally, by the passage formed through the centre of each induction pipe for the sparking plug in the centre cylinder of each block of three.

In this, as in the 18-cylinder and the 6-cylinder types, there are two camshafts for each set of cylinders. These camshafts are lubricated by low pressure and are operated through a train of enclosed spur wheels situated at the magneto end of the machine.

The 6-cylinder, 170 brake horse-power, vertical Sunbeam-Coatalen type employs the same general principles, including the detail that each carburettor serves gas to a group of three cylinders only. It will be observed that this engine presents notably little head-resistance, being, therefore, particularly suitable for multi-engined aircraft.

The public has more or less the impression that aircraft engines of 100 and 150 horse-power are sufficient for the needs of this war; whereas the series of engines in question—which are only a few of the war-time Sunbeam-Coatalen models—reveals how very much greater have been the demands made on aircraft engine builders.

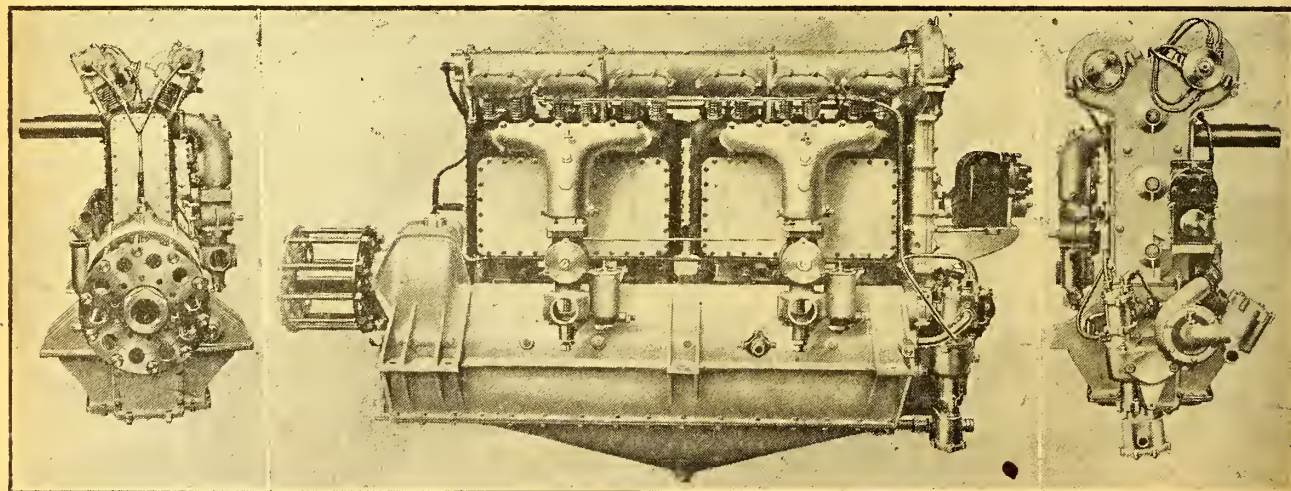
It is one thing, however, to make a demand and another guess matter to find that the engineer and constructor can between them meet it. All the more honour, therefore, to Mr. Louis Coatalen as engineer, to the Sunbeam Motor Car Company as

constructors, and to Wolverhampton as the city where its works are established, for being able to render such signal service alike to our Air Services and to those of our Allies in the present critical period in the world's history.

A STOCK-TAKING SALE.

The Ministry of Munitions has some 116 aeroplanes of various types for sale, all of which, with the exception of ten twin Curtiss machines, are minus their engines. Colonel Fletcher, Inspector of Stores Depots, to whom all applications should be made, stated recently that all the machines are quite air-worthy. "They are not 'duds,'" he added, "but reliable machines which come on the market simply because they are taking up valuable storage room which we require for machines of newer types. Many of them, most of them indeed, are quite new. It is essential that we always keep plenty of the latest machines in reserve, and when these machines are superseded by better types they are set aside. We can only supply the very best on hand to our men at the front. These machines are out of date, both as regards speed and fighting capacity, and we must have the storage room for our store of the very latest machines with all up-to-date improvements."

These machines will be sold either singly or in bulk. They should be useful, when supplied with engines, for training purposes, and it is said that those who buy them will probably be able to obtain certificates to establish a civilian flying school. This chief difficulty will be the provision of engines, but, perhaps, obsolete engines such as the R.A.F. may also be obtained if the buyer asks nicely, though the R.F.C. might be too proud to advertise R.A.F.s. for sale. Anyhow, the 90 Curtiss is an excellent school engine.



The 6-cylinder single-row Sunbeam-Coatalen Engine with overhead valves, one of the prettiest jobs yet produced.

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AMERICAN DEVELOPMENTS.

The Aircraft Production Board of the Council of National Defence publishes some details regarding the plans for an American Aviation Corps. (Apparently America has a liberal-minded censorship.)

Three huge aerodromes are being constructed in the United States. In France a position for the final training camp has been chosen. It is hoped that at least 500 men will be trained by the end of next month, and that in the forthcoming year 6,000 pilots will be turned out. In the smaller aviation camps already existing work is already proceeding vigorously. The Board expects to construct 3,500 machines during the next 12 months. Contracts for some of them are already let.

Newspapers like the "New York World" and the "Sun," nevertheless, warn the public against expecting too much. They point out that when the war started the American Aviation Corps scarcely existed, and that virtually all the American machines are merely training machines. The "Sun" says that much planning of facilities, human and mechanical, remains before the great enterprise can be got fairly under way.

THE ACCURACY OF THE PRESS:

A highly esteemed friend of THE AEROPLANE, writing apropos the Civil Aerial Transport Committee, comments on the curious descriptions of the members of that Committee as set forth in the daily Press. He draws particular attention to the "Globe," which describes Mr. Holt Thomas and Mr. Berriman as being writers on aeronautics, Colonel O'Gorman as Superintendent of the Royal Aircraft Factory, and General Ruck as ex-Chairman of the Aeronautical Society.

The writer remarks: "So many errors in so small a space indicate that we have a lot to do yet before those prominent in the Aircraft Industry are as well known to the man in the street, and those journals who lay themselves out to educate (?) him, as, say, Scotch comedians or pigeon fanciers."

Alas! 'Twas ever thus. The world knows but little of those who do most to save it from itself.

THE RELIABILITY OF EVIDENCE.

The following amusingly confused account of the "Gena" incident was given to a North Sea pilot who landed at Deal the next night to a "Morning Post" representative. He said:

"My attention was first drawn by the whirr of an aeroplane's engine overhead. On looking upwards I saw two machines in company. One descended to an altitude of about 500 ft., and one could see that she intended dropping something on the 'Gena.' I distinctly saw and heard a bomb fall about a few yards astern of the vessel. Seeing that his companion had failed, the second aviator swooped down to an extremely low altitude. He did not seem more than 30 ft. from the bridge of the 'Gena.' In fact, he was so low that he appeared almost to touch the vessel. He dropped a torpedo, which hit the 'Gena' in the centre, and then made off. What became of the 'Gena's' crew I cannot say. When I came down Channel to-day I passed by the same spot and saw the wreck of the 'Gena.' She is lying on her broadside, with only her mast-top visible." [It is not clear how a seaplane which was only 30 ft. from the bridge of the vessel managed to hit her with a torpedo, and a torpedo which hit the ship and then made off must be of a very useful type,—but perhaps he said "went off." The ship which lay "on her broadside with only her mast-top visible" somehow reminds one of the late Mr. Robert Montgomery's "souls which upward mount, as streams meander level with their fount." Which only shows that ocular evidence—pace General Henderson—is not much more reliable than hearsay.—C. G. G.]

A NEW AIRCRAFT CONCERN.

Aircraft manufacturers will be interested to learn that a firm has been created at Plaistow, to be known as The Aircraft Construction Co., which is ready to undertake the manufacture of aircraft parts.

The principals are Messrs. E. Harley Bell and Robert P. Grimmer. Mr. Bell is well known in connection with "Non-flamoid," the product of the London Label Co., Ltd., and all those who have followed the progress of aviation since the early days are acquainted with the part which Mr. Grimmer has played in association with Mr. R. F. Mann, not only in the manufacture of models on a commercial basis, but in the construction of an interesting full-sized pusher biplane with twin propellers, which flew well at Hendon.

It is the intention of the proprietors to commence the manufacture of complete aeroplanes on a large scale at an early date, probably at Hendon, and in this connection it is hoped to secure the services of Mr. R. F. Mann, as they feel that his experience will be an asset in the design department.

Mr. William Gray, who was works foreman of the firm of Mann and Grimmer, will be in charge of production, so the quality of the workmanship is assured.

The Aircraft Construction Co. occupy premises known as Harley Works, Beckton Road, Plaistow, London, E. Their telephone number is East 1300.

AUSTRIAN CLAIMS.

The Austrian-Hungarian war Press quarters reports:—"The Italian losses of aeroplanes in the time from September 1st to December 1st, 1916, are: 1 Farman and 1 Caproni, captured by us, further 8 aeroplanes, which smashed behind the hostile lines according to undisputable observation by our observers. During the same period of time we lost 6 aeroplanes, and thus 3 came to end behind the hostile lines, while the 3 others were forced to land from hostile effect in our own lines. Thus the report of the 'Times' of December 11th is wrong, to the effect that 20 Austrian aeroplanes had been shot down in aerial engagements during the last three months against only four Italian aeroplanes."

ADDRESSES OF OUR ALLIES.

Below will be found the names and addresses of the chief firms in the Italian and French Aircraft Industries. It is hoped that the list may assist communication with our esteemed Allies.

ITALIAN FIRMS

- FABRICA "A.E.R." AEROPLANI, Orbassano, Turin, Italy. (Aeroplanes.)
 F.A.I.F. FABRICA AUTOMOBILI ISOTTA FRASCHINI, Via Monte Rosa 79, Milan, Italy. (Aero Engines.)
 ENEA BOSSI, Fabbrica Aeroplani, Bovisio, Milan, Italy. (Aeroplanes.)
 FRANCESCO ONETO, Aerodromo San Giusto, Pisa, Italy. Also at Via Garibaldi 12, Genoa, Italy.
 MECCANICA LOMBARDA, Monza (via Marsala 7), Italy. (Aeroplanes.)
 SOC. ANON. PER COSTRUZIONI AERONAUTICHE. (Ing. O. Ponilio & Co.), 366, Corso Francia, Turin, Italy. (Aeroplanes.)
 SIGG. GIO ANSALDO & C., Cantiere Navale (Aviazione), Sestri Ponente, Genoa, Italy. (General.)
 SOCIETA IDROVOLANTI ALTA ITALIA (S.I.A.I.), Works: Sesto Calende, Lago Maggiore, Italy.
 And at Via Siliro Fellico 12, Milan, Italy. (Aeroplanes.)
 SOCIETA ITALIANA MOTORI G'NOME E RHONE, 73, Strada Veneria, Madonna di Campagna, Italy. (Aero Engines.)
 SOCIETA ITALIANA TRANSEARA, Offices: 251, Corso Pioschiera, Turin, Italy.
 Aerodrome: Mirafiori, Turin, Italy. (Aeroplanes.)
 SOC. NIEUPORT MACCHI, Varese, Italy. (Aeroplanes.)
 SOC. OFFICINE SAVOIA, Bovisio Mombello, Italy. (Farman Aeroplanes.)
 SOCIETA PER LO SVILUPPO DELL'AVIAZIONE IN ITALIA via S. Radegonda 11, Milan, Italy. (Caproni Aeroplanes.)

FRENCH FIRMS.

- AERA, 16, Avenue de la Grande Armée, Paris, France. (Accessories, Equipment.)
 AEROPLANES CAUDRON, 52-70, Rue Jean-Jacques-Rousseau, Issy-les-Moulineaux, Seine, France. (Caudron Aeroplanes.)
 AEROPLANES H. & M. FARMAN, 151-169, Rue de Silly, Billancourt, France. Aerodrome at Buc. (Henri and Maurice Farman Aeroplanes.)
 ANZANI, MOTEURS D'AVIATION, 112, Boulevard de Courbevoie, Seine, France. (Anzani Aero Engines.)
 ARMENGAUD JEUNE, 23, Boulevard de Strasbourg, Paris, France. (Patent Agent.)
 ASTRA, SOCIETE DE CONSTRUCTIONS AERONAUTIQUES, 13, Rue Couchot, Billancourt, Seine, France. (Airships and Balloons.)
 BESSON, MARCEL, Route de Meulan, S.-et-O., France. (Aeroplanes.)
 BINET (ALPHONSE), 37, Boulevard Bourdon, Paris, France.
 BLERIOT (L.), 2, Quai de Suresnes, Suresnes, Seine, France. Aerodrome at Buc (pres Versailles). (Bleriot Aeroplanes.)
 BOREL, SOCIETE ANONYME DES AEROPLANES, 22, Boulevard Bourdon, Neuilly, Seine, France. (Aircraft.)
 BREGUET, SOCIETE ANONYME DES ATELIERS D'AVIATION LOUIS, Velizy, par Villacoublay, S.-et-O., France. Aerodrome, Villacoublay. (Breguet Aeroplanes.)
 CARBURATEURS CLAUDEL, 41, Rue des Arts, Levallois-Perret, France. (Carburetters.)
 CLEMENT-BAYARD, LA MAISON, Quai Michelet, Levallois-Perret, France. (Airships.)
 CLERGET ET BLIN, 30, Rue Cave, Levallois-Perret, France. (Aero-motors.)
 CONSTRUCTIONS AERONAUTIQUES, SOCIETE ANONYME DE, 206, Boulevard Pereire, Paris, France. (Morane-Saulnier Aeroplanes.)
 CROCHAT, T. E. V., 6, Quai de Gesvres, Paris, France. (Aircraft Mechanical Transport.)
 EMAILITE, LA MAISON, 22, Rue Perrier, Levallois-Perret, France. (Emailite Aeroplane Dope.)

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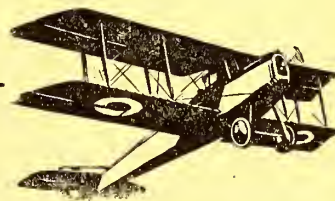


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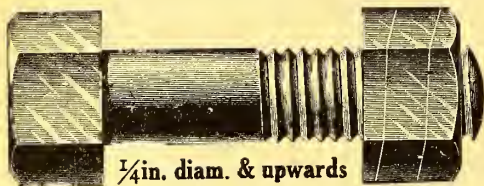
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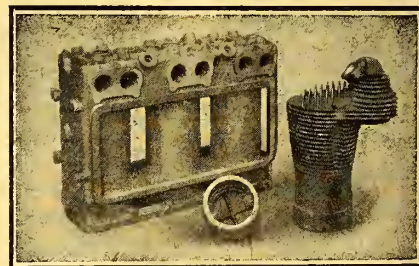
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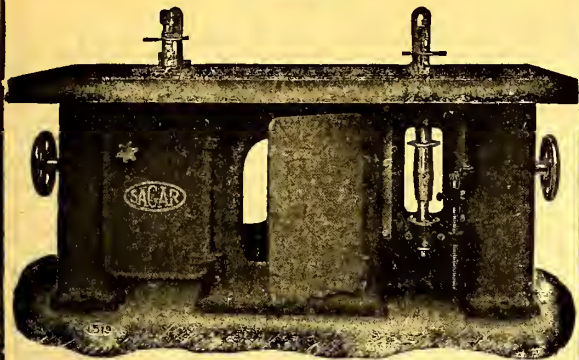
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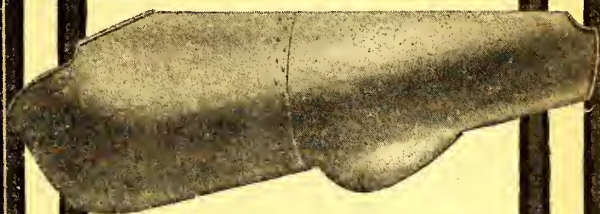
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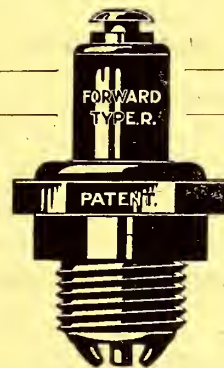
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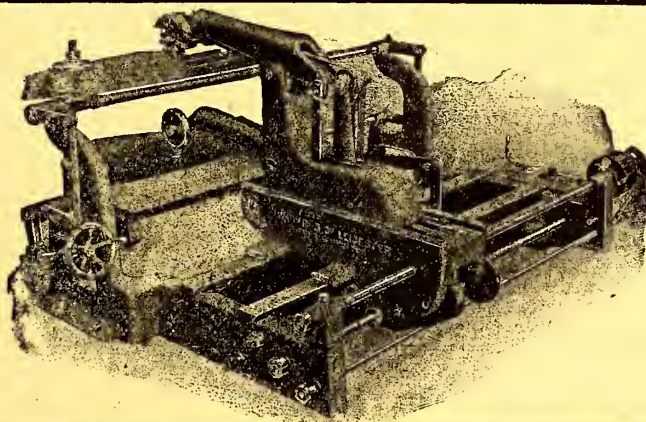
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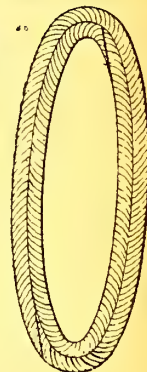
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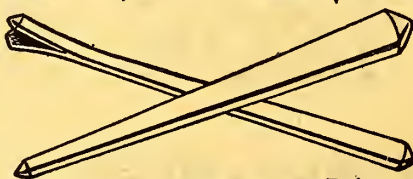
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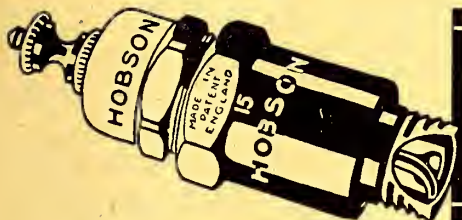
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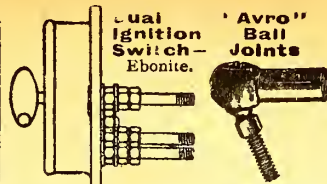
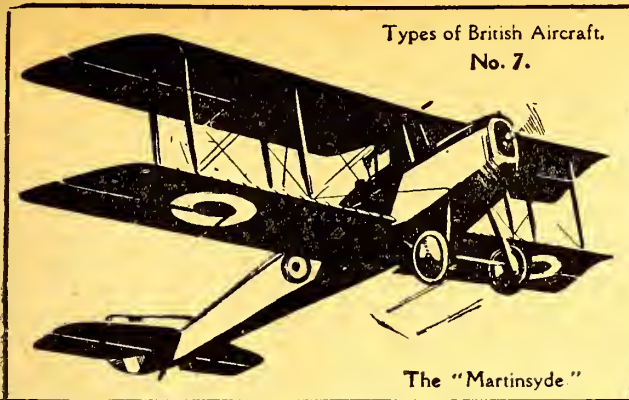
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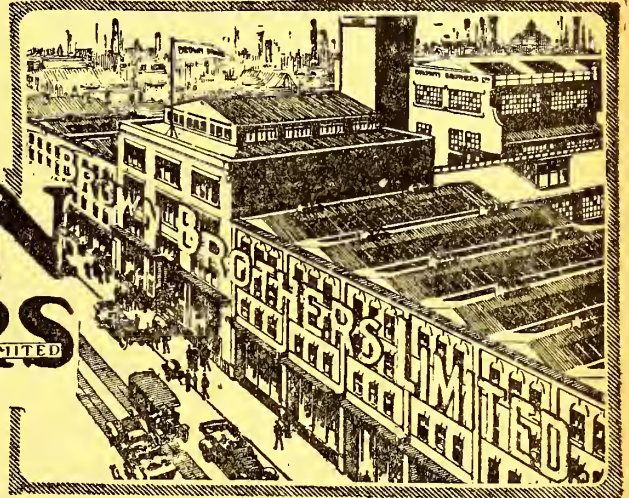
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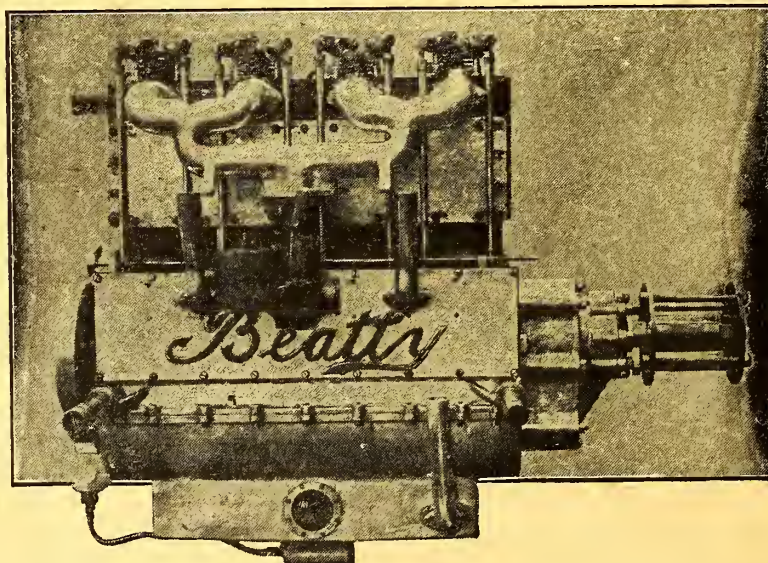
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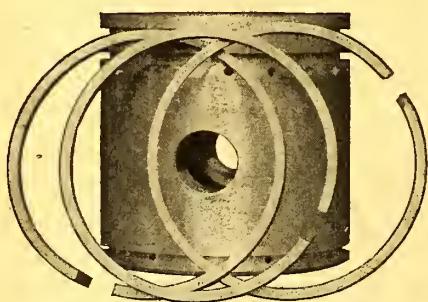
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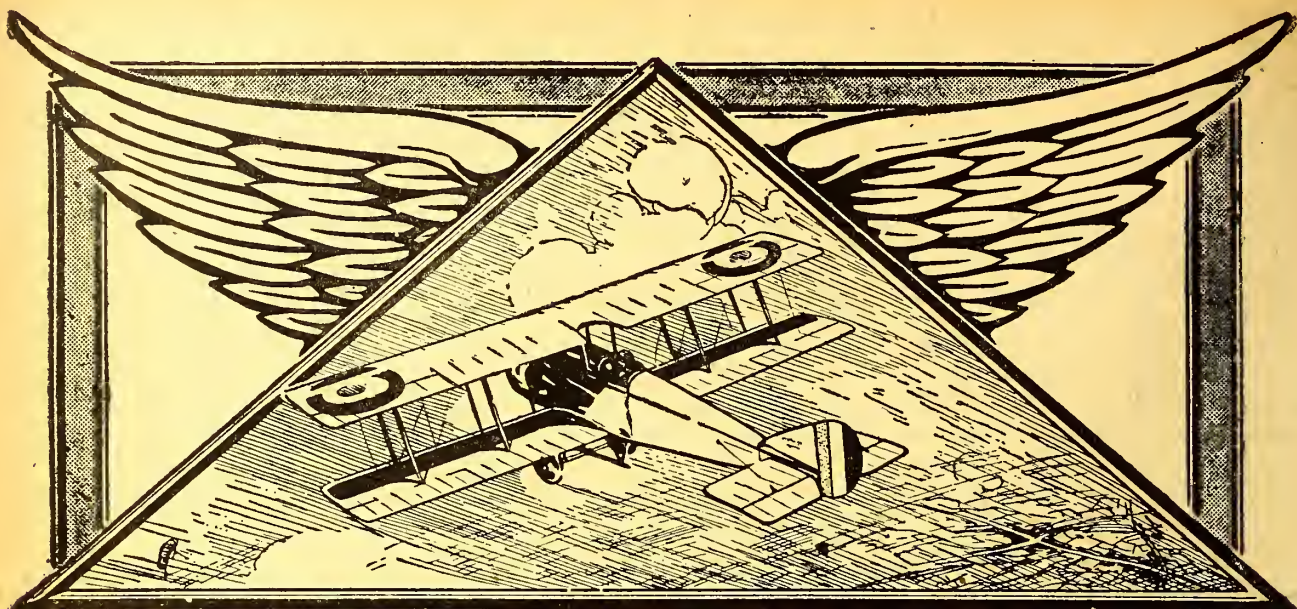
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ON M.P.s, FOLKESTONE, AND THINGS.

Really there is nothing else to be done. There are plenty of interesting things about which one would like to write, but these South-Eastern places will insist on getting themselves bombed, and people in Parliament will insist on talking about it, so one has no choice but to write about it also, chiefly because there are all sorts of moral lessons hanging thereto. Of course, one is very sorry for the people of Folkestone and of the South-East Coast generally, but one's sympathy is rather discounted by the feeling that a people gets what it deserves, whether M.P.s, newspapers, or bombs.

Certainly most South-Eastern M.P.s seem to adopt an exemplary attitude, from the Governmental point of view. That is to say, they do not criticise Government action or inaction, as does the irrepressible member for East Herts, for instance. In fact, their attitude reminds me somewhat of that famous Irish absentee landlord in the good old Fenian times, when tenants reduced their rents with a shot-gun. This landlord's agent wrote to him to London, saying that the tenants threatened to shoot him if their rents were not reduced. To him the landlord replied, "Tell the tenants that, if they think they can intimidate me by shooting you, they're jolly well mistaken." Similarly, some M.P.s might say to their constituents, "If the Germans think they can frighten me by bombing you, they're jolly well mistaken."

Something of the same spirit seems to have animated French officialdom in the early days of the war, when the Government turned their backs on Paris and made off to the beauties of Bordeaux, whereupon the wits of the Boulevard cafés called them "*Tournedos à la Bordelaise*." The Government of the day, on the eve of its departure for Bordeaux, issued a long, inspiring, and patriotic address to the Citizens of Paris, calling upon them to bear their afflictions with calmness and courage. Which lengthy address was boiled down by the inevitable Boulevard wit to the single phrase, "*Restez-vous tranquille, je fous le camp*."

One would think a whole lot more of some of the South-Eastern M.P.s if they resided regularly in the new danger-zone instead of telling their constituents to be tranquil and clearing out of the zone themselves. And, anyhow, they need not try to be funny about it in the House at the expense of other members who treat the matter as being serious, not, perhaps, because a few people have been killed in Folkestone or some health resort on the Medway, but because these little raids by a dozen and a half machines or so are a warning of what is to come if we remain apathetic.

They might easily have been prevented by anyone possessing even mediocre intelligence, by the process of stopping them at their source, and the mere plain fact of their being able to arrive is as much an insult to the King's Services as was the behaviour of a certain

Hun officer who spat in the face of the British officer who took his surrender, though one is glad to hear that the Hun was promptly "done in" by a sergeant who was with the British officer.

Still, of course, one cannot expect the modern shop-keeper M.P. to have the same fine sense of personal or national honour as was possessed in the days when the country was governed by its aristocracy, either by themselves directly in the House, or by their nominees to pocket boroughs. The art of governing has degenerated sadly and regularly after every step in the lowering of the franchise qualifications, and our only hope of national redemption appears to lie in the chance that when women have votes their feminine intuition will enable them to elect capable men instead of the appalling humbugs whose glib tongues suffice to win the votes of the mere docile man-thing.

There are, of course, honest men in Parliament, even to-day. One of them, among the most earnest believers in air-power, said to me some time ago that so little did he esteem the intelligence of his fellow-members, and so harmful did he consider the Government as then constituted, that if he could assure the wiping out of the whole lot by a Zeppelin bomb by himself rising and addressing a full house, he would cheerfully sacrifice his own life in the explosion, for the good of the nation.

I told this heroic saying to another member, a great friend of his, I believe, as an example of the earnestness of some, at any rate, of the elect of the people, and the only comment the friend made was, "Yes, I suppose if old So-and-so could only get a full house to listen to him for once in his life, he would die cheerfully. He always clears the house far more effectually than any Zeppelin bomb could."

(No! Neither of them represented East Herts. Nor any of the be-bombed constituencies.)

FIGURE PUZZLES.

However, to return to the South-East Coast. Certainly Tuesday's raid (June 5th, that is to say) was less satisfactory for the Hun than the Folkestone raid, but one would be able to judge the diminution in satisfaction better if one could get at the figures.

First of all, the Admiralty Communiqué of the 6th tells us that 18 German machines were seen leaving the Belgian coast by Ostend, and that the Dunkirk pilots "encountered 16 hostile aircraft off Ostend returning from their raid on England." Which seems to show that two had, like Joseph's brethren, fallen out by the way.

Now, the Home Command Communiqué of the 5th says that 2 enemy machines were brought down, which might account for these two. But the Admiralty Communiqué of the 6th says that 2 machines were "driven

down" by a Naval machine from the Kentish Coast, which landed afterwards at Dunkirk. That lad who fought his passage across the Channel deserves recognition, for obviously he was on a land-going aeroplane, but it is still not clear whether these two machines were those mentioned in the Home Command Communiqué or not.

Then the Admiralty Communiqué of the 6th goes on to say that of the 16 which returned to Ostend 2 were "completely destroyed," and 4 others "were driven down out of control, of which 2 are considered also to have been destroyed."

OUR OPTIMISTS.

Of course the lay Press, with its usual cheery optimism, announces joyfully, "Ten Hun Aeroplanes Down," and deduces that only 8 got home. Some papers accept the lower estimate by people on this side of the Channel, that only 16 machines came over to this side, and so only 6 returned safely.

Ten machines lost out of 16 is too heavy a proportion to be profitable. The deduction is that, not being a paying proposition, the Hun will not do it again, and so the South-Eastern Counties may live in peace, and the M.P.s thereof may safely reside among their constituents.

But let us look at it another way. Suppose the 2 machines of the Home Command Communiqué and the 2 of the Admiralty Communiqué are the same, and that 18 Huns left Belgium and 16 returned until met by the fighting squadron from Dunkirk. We have the absolute statement that 2 of them were "completely destroyed," and that, of the other 4 "driven down," 2 are "considered to have been destroyed." Now, a machine which has been merely "driven down" may be only slightly damaged, and the pilot may not be damaged at all, so it is safest not to count them. So on this reckoning we know for certain that out of 18 machines the Germans lost 4. Or if those "considered to be destroyed" were in fact destroyed, they lost 6.

The loss of 6 machines out of 18 on such a venture may be considered, from the Hun point of view, to be good business. And the loss of 4 out of 18 certainly would be so, from any military standard of losses in attack. So the time has not yet come to assume that we have already regained the Command of the Air over the sea between Belgium and England.

PROTECTION.

Presumably if such raids continue, as on the figures we may reasonably expect them to do, we shall have an outcry for more defensive aeroplanes along the coast. I do not mean that the South-Eastern M.P.s will get up in the House and cry aloud for protection for their constituents. That might mean offending Ministers. They would be much more likely to meet the proper Minister quietly behind the Speaker's chair, and say, "Of course, we don't want to make a fuss in the House, but really, you know, unless our constituents are protected—well, what can one do for one, as it were?"—or words to that effect.

And then squadron after squadron of perfectly good fighting machines, which might be much more usefully employed in France, would be strung out along the coast all the way from Dungeness to Harwich. Which would be distinctly a waste of good material, considering that, if the patrol business must be done, it is so much easier to patrol the Belgian coast from Nieuport to the Dutch frontier than to patrol the English coast.

Moreover, if protecting aeroplanes go up from the English coast a minute or two late, they either miss the enemy altogether or have a long stern chase across the wild, wet North Sea, whereas a pilot starting late

from Dunkirk and missing his targets can come back to the aerodrome, have his breakfast, or lunch, or tea, in comfort, fill up with fuel and ammunition, and dash off in time to catch the raiders on their way home. So evidently Flanders is the best outpost of our Home Defences, and we ought not to keep trained fighting squadrons on this side of the water, waiting for intermittent raids.

And so long as there are some obviously fast aeroplanes to go up from coast aerodromes when raiders arrive, none of the aborigines nor of their M.P.s are at all likely to worry about whether they are of the newest fighting squadrons or not. With which preliminary observations let us proceed to the doings of the Talking Shop.—C. G. G.

AS OFFICIALLY REPORTED.

The following extracts from the official Parliamentary Reports, commonly known as "Hansard," tell what took place—minus excisions to save space, and plus explanatory interpolations in brackets:—

ENEMY AIR RAIDS.

On June 5th Mr. Pemberton-Billing (by Private notice) asked the Prime Minister whether the Government is prepared to make a statement for the reassurance of the public as to the prevention of daylight raids by enemy aeroplanes by the adoption of a policy of reprisals on the principle of two bombs for one on enemy towns of equal military significance to those recently raided by the enemy in this country.

Also, if he will consider the standardisation throughout the United Kingdom of a system of warning both for day and night raids;

Whether he will reconsider the Government's decision to refuse compensation to the people of this country who have become victims of our inadequate air defences;

Whether he will appoint a Commander-in-Chief to be in sole and absolute control of the air defences of this country;

Or, alternatively, whether he will request the Admiralty to instruct the Vice-Admiral Commanding Dover Patrol to prevent the concentration in Flanders of enemy aeroplane raiding squadrons by employing the facilities at his disposal in the squadrons of the R.N.A.S. in Flanders under his command;

And whether, failing the adoption of some or all of these expedients, he will instruct the competent military authorities to make arrangements for the immediate evacuation of the entire civil population of all the towns on the east and south-east coasts within striking distance of the known enemy aeroplane concentration bases in Flanders?

Mr. Bonar Law: Many places in the occupation of the enemy of at least equal military importance to the towns recently raided are constantly bombed by our air forces. Zeebrugge alone was raided on twenty-four separate occasions in April and May, when over 1,000 bombs, containing thirty tons of explosives, were dropped; the system of warning for day and night raids is being improved; the reply to the third part of the question is in the negative. As regards the fourth part, the Commander-in-Chief Home Forces is in control of the air defences of the country; in these circumstances the Government is not prepared to adopt the suggestion contained in the last part of the question.

Mr. Billing: May I ask is it the intention to use the principle of reprisal raids when the enemy raids towns of no military importance and kills people in this country?

Mr. Bonar Law: It is the intention to use our air forces in the way in which it is considered they may inflict the greatest amount of damage on the enemy.

Mr. Billing: Are you prepared to consider the question of compensation for poor people who have been injured and whose property has been destroyed owing to inadequate air service?

Mr. Bonar Law: That question has been discussed many times.

Mr. Billing: Is the Government prepared to consider it?

Mr. G. Faber: This question of the air defences being insufficient, may I ask the right hon. gentleman whether he is aware that it is the fact that the German aeroplanes coming in the daylight come at something like 12,000 feet in height, and that they come singly and concentrate when they arrive here, and that it is extraordinarily difficult to prevent them?

Mr. Bonar Law: I am sure that the House fully realises the point raised by my right hon. friend. The Government and the War Office and the Air Board have been in constant communication as to the best method of dealing with the matter.

Mr. MacVeagh: What Minister is at present in charge of the air defences?

Mr. Bonar Law: I have said that all the air defences at home are entirely under the control of the Commander-in-Chief of

the Home Forces. As regards the general Air Services there is, as the House knows, an Air Board, and there is also the Army and Navy in control.

Mr. MacVeagh: I asked about a Minister of Air.

Mr. Bonar Law: I have said there is no Minister in command of the air forces.

[Perhaps Mr. Bonar Law will consider whether Zeebrugge is precisely the equivalent of Folkestone. One has always understood that the population of Zeebrugge is chiefly Belgian, and therefore we are not touching the people of Germany, but merely the German Army. Naturally, all docks, harbour works, canal locks, and so forth at Zeebrugge should be destroyed, as being military works, but, so far as Zeebrugge itself is concerned, one would rather see Trèves or Colmar destroyed. Apropos which district, it seems a long time since we heard anything of the R.N.A.S. detachment which raided Freiburg, and Breybach, and such places. The location of that detachment seemed the right place for reprisals, as distinct from inhibitory raids.]

EVENING AIR RAIDS.

Mr. Billing, Member for the East Herts Division of Hereford, rose in his place, and asked leave to move the adjournment of the House for the purpose of discussing a definite matter of urgent public importance, namely, "the recent enemy aeroplane raids and the lack of an adequate offensive to prevent the same," but the pleasure of the House not having been signified, **Mr. SPEAKER** called on those Members who supported the Motion to rise in their places, and, less than forty Members having accordingly risen, the House proceeded to the Business of the Day.

AERIAL CIVIL COMMUNICATIONS COMMITTEE.

On June 5th **Mr. P. White** asked the Prime Minister whether he is aware that there is no Irishman representing Ireland on the Committee appointed to inquire into aerial civil communications after the war; whether he is aware of the possibilities presented for that purpose by Ireland's position in relation to the Atlantic routes; whether the French Government, prior to the war, maintained a regular service from Paris by aeroplane which carried the mails to Pauillac, on the west shore of the estuary of the Gironde, twenty-seven miles from Bordeaux, whence they were transferred to the outgoing trans-Atlantic liners; whether the aeroplanes were similarly used to convey the incoming mails landed at Pauillac to Paris; whether by this aeroplane service there was considerable gain of time for posting and delivery of letters; and whether, in order that the advantages offered by Ireland for an even greater acceleration by air of the mail services may be availed of, he will appoint an Irish representative or more than one on the Committee?

Major Baird (in a written answer) said: It is not considered that the addition to this Committee of national representatives as such of the several parts of the United Kingdom is required for the effective discharge of its duties under the terms of reference. I can assure my hon. friend that the obvious possibilities represented by Ireland in relation to the Atlantic routes will be fully considered by the Committee.

[Another injustice to Ireland. Why should not Ireland be represented equally with South Africa, Australia, and India? And is not Ireland "the next parish to America" on the trans-Atlantic Air Line? And, bar Lord Northcliffe and Lord Drougheda, there is not a single born Irishman on the Committee.]

ENEMY AIR RAIDS.

On the motion for the adjournment, **Mr. Billing** said:—At Question-time to-day I had occasion to refer to the recent daylight aeroplane raid, and in view of the exceedingly unsatisfactory reply I received I am taking the very earliest opportunity of raising the matter. The question I asked was a very definite one, and I received something in the nature of an

indefinite reply. I asked whether the Government is in a position to reassure the public, especially those who live within striking distance of the enemy aeroplane bases in Flanders, that it is taking serious steps to stop the raids which we may reasonably anticipate will be taking place with heavier-than-air machines in the next few months by daylight. I was told in reply that bombs had been dropped on Zeebrugge. I am very glad to hear that, and I would suggest it is about time they were.

For fifteen months I have endeavoured by every means in my power, by Parliamentary and unparliamentary methods, to persuade the Government to drop bombs on the submarine bases and the German aerodromes in and around Ostend and Zeebrugge, and it is only during the last four weeks that anything approaching success has attended the efforts which have been made in this House. I do not think I am exaggerating if I say that in the last four weeks more tons of high explosive have been dropped in that district than during the whole previous time of the war.

We knew, or should have known quite well, where the Germans would endeavour to get their submarines launched. I have particular knowledge of where they were erecting them. In my Services days I pointed out again and again to the First Lord of the Admiralty that the proper way to attack both the submarine menace and the Zeppelin menace is where these engines of war are in process of construction, rather than to wait until they are launched and commissioned and have become a serious menace.

But that matter has no direct bearing on the question I want to raise to-night about the defence of this country against the heavier-than-air machines. I hope the system which has now been introduced, after many years, for dealing with the night attacks of the lighter-than-air machine is successful, inasmuch as it has been found possible and practicable to bring down airships as distinct from aeroplanes; but it is a very different proposition when we come to deal with heavier-than-air machines.

The chances of bringing down heavier-than-air machines in a daylight raid are very small. The chances of bringing them down, should they commence night attacks by aeroplanes, are practically nil.

They come over at an altitude of 15,000 or 16,000 ft., where a searchlight can barely pick them up, and if it can, their size is so infinitesimal that it is impossible to keep the beam on them. It is almost impossible to shoot at them, and if we send our own machines up to fight them, although we might use a series of coloured lights to try to distinguish between our machines and theirs, I fear that in ordinary air fighting by night it would be utterly impossible, flying at about 15,000 ft. at the rate of 100 miles an hour, to distinguish between friend and foe, and it might only result in our own men shooting each other.

The foe's idea would not be to engage our men at all, but to drop their bombs and get back as quickly as possible. Therefore, I think we can dismiss the idea of protecting this country from aeroplane raids by night by any means of defensive operations. At present it would not be sound policy to bring machines and pilots who are really needed on the Western Front back to England to defend the country. But I wonder whether the Government will ever discover that the finest form of defensive operations lies in the offensive. I am perfectly confident that the country which obtains the supremacy of the air will make air war so terrible for the other country that it will not dare to challenge it.

I would not like to suggest what the feeling of this country would be if we had the repetition on a large scale of the incident—a quite small incident of the war, a mere nothing as an incident of the war; but, taken as a sign, that it might become a very serious thing—which occurred in the raid upon Folkestone last



A Batch of the Sopwith Triplanes eulogised by General von Höppner, Chief of the German Flying Corps. It may be added that the whole batch was tested by Mr. Clifford B. Prodder for official acceptance in the space of one day.

week. There was a case in which eleven aeroplanes actually dropped their bombs. We will say that twelve aeroplanes actually took part in the raid, with the result that great destruction and devastation was occasioned. I would ask this House, or the few Members who are sufficiently interested in the air defences of this country to remain to listen to this Adjournment Debate, to imagine what it would mean if that raid was multiplied one hundredfold.

Say a hundred squadrons of ten machines each came over. That is not a very large number. One thousand machines is a very small order to-day. Anyone who has intimate knowledge of our own building figures knows that 1,000 machines is nothing. At the beginning of the war it was a big proposition. Now 1,000 machines from the point of view of money is only the cost of two hours of war, and from the point of view of personnel it means only 2,000 or 3,000 men. One cannot suggest, therefore, that it is a big matter to assume that 1,000 Folkestones, or 1,000 towns similar to Folkestone, received bombardment from ten machines simultaneously, and that instead of 200 people being killed or injured 100 times 200 people had been killed or injured in half an hour. Would the Government then wake up to the possibilities of the air as a means of offensive?

These enemy aeroplanes have their concentration bases in Flanders, and again and again I have requested the First Lord of the Admiralty to bring pressure to bear upon the Vice-Admiral commanding the Dover Patrol to stop these concentration bases. I am not satisfied even now that the Vice-Admiral of the Dover Patrol was not aware, before that squadron left Flanders, when they were concentrating for a raid on England.

Surely that is the time to strike them. Assuming that the reports we get in the daily Press are to be believed and that we have the absolute command of the Western Front, so much that we have access to the German movements and we view their acts of concentration and everything else, our pilots must have been able to inform us that these machines were concentrated in one spot, fifteen or sixteen of them, for a raid. Surely there must be an area in Flanders which is the most convenient to be used as a striking point for raids on this country.

The Germans are at least intelligent. We must pay them that compliment. We may not admire their ways or their principles, but it is a mistake to underestimate their ability. The secret of success in a bomb-dropping expedition is to save petrol, because every mile you can save in the distance you fly means so much more explosive you can carry, and so much more deadly is the effect of the raid. Therefore, it is reasonable to assume that the Germans concentrate at the nearest possible point to our coast. The further we drive them back, the more we harass them where they concentrate, the further they will have to go back into Flanders or even into Germany for concentration bases to initiate their raids. The further we drive them back the less explosives they can carry, because the more petrol they have to carry, and the more miles they have to fly, the greater chance we have of engaging them before they arrive.

If anyone wanted a good illustration of what we have come to in this country, look at what happened this afternoon here, when the report went round that there was an air raid over London. The Terrace collected more Members in a few minutes than any air debate in this House collected in hours. The Terrace was full of Members gazing up to the sky.

What I want the Government to understand is that the only useful purpose they can serve by the defence of this country in this country is to reduce the Zeppelin menace, which they have done—they could not help it—and to see that a fair system of warning is in operation throughout the whole of the country that is likely to be affected.

It is quite useless to introduce a system so that in Folkestone someone will ride round on a bicycle waving a flag, or in Margate, if there is a raid, someone goes down the street and blows a horn, or at Broadstairs the town-crier goes round wearing a steel helmet. That sort of thing is all nonsense. If there is going to be any form of warning it must be universal, and it must be systematised. It is an open question whether warnings are advisable, but in cases where warnings have been given life has undoubtedly been saved.

Surely the taxpayers and the citizens of this country have a right to claim something more than a mere warning to hide in the ground because the enemy is approaching. Surely they have a right to claim that the air offensive should be carried to the spot whence the enemy raiders come, and whence with a little intelligent anticipation and a sound policy in the past the raider would never have left to raid this country.

I was discussing with a Member of this House to-day the question of reprisals. He was against the policy of reprisals, whatever it may mean. I said to him, "If by introducing reprisals to-morrow, and if by initiating raids on German townships to-morrow you could win this war, and if by not doing so you lose this war, what would you do?" He said, "By all means do it." I am sure there is no right hon. gentleman who would say otherwise. If I suggested to the Under-Secretary for War that it was possible to win this war, or if I

satisfied him that by initiating a great raid on German townships it was possible to finish the war in a week, would the Government do it? I am quite sure he would reply, "Certainly."

It is not a question of principle. It is not principle that is holding us back. If it is principle, we are more infernal hypocrites in this country than I thought we were.

We know what a disturbing effect air raids have in this country and how cheaply the effect is gained by the enemy. Are we to assume that the German civil population are more courageous than we? Certainly not. I am prepared to assert exactly the opposite—that the raid on Freiburg, which was called a reprisal raid—but which was a genuine raid, a war-like action, had the most extraordinary effect on the German population.

I think that Germany was more frightened by that raid than by anything else which we did during the war. What did we do? We broke our principle and dropped bombs, and not only that but we dropped messages saying, "This is a reprisal raid. We have sacrificed all our principles because you sank a hospital ship, and this is what we are going to do. What happened? They sank two more hospital ships. What did we do? Nothing."

We have the machines and the pilots, and now that we have broken our principle I ask the Front Bench to initiate these raids. Despite the tons of bombs dropped during the last few weeks, not 20 per cent. of our machines have been engaged. Yet here we have thousands of machines in this country and vast numbers of pilots doing absolutely nothing of military significance in the war at the present time. These men could be employed in striking, not one such blow that Germany struck at us, but twenty in one afternoon. If we did that I do not think that we should be troubled any more with aeroplane raids in this country.

I would also suggest that we should at least stop the aeroplane raid before it becomes a serious menace. It will become a serious menace if it is allowed to go on. We can protect ourselves against it only by a counter-offensive.

I should also like to know whether, for the control of the defence of England, we can have one man to whom this country can look who will have absolute responsibility for that and nothing else? Lord French, who has anticipated the landing of the enemy in this country, has the whole weight and responsibility of the movement of our defensive troops on his hands. He might have been called at four o'clock this afternoon from the middle of a weighty conference to defend London against an air raid. We want a capable man of aeronautical experience and training, and not too senior in age, to be immediately and absolutely responsible for initiating systems of warning for the police, the civil population, and the military, and for giving the actual orders, and arranging a system whereby the pilots of this country will know where they stand.

[So far as the R.F.C. is concerned no improvement could be desired in this respect, but it is not quite clear what happens or who is responsible below High Water Mark.]

I have heard that two officers were court-martialled over the last raid because they insisted on going up without orders. I ask the right hon. gentleman whether he can help me about this. The pilot does not know where he is. I have heard that it is a common thing for a C.O. to be away from his station when a raid occurs, and you have everybody rushing about and telephoning, asking, "Where has the raid occurred? Has anybody heard of German aeroplanes? What have we got to do?" You see naval officers ringing up the police stations to know if they have heard anything of Germans dropping bombs a few miles away. The whole thing is preposterous. The Home Office is advising the police. Somebody else is advising the Anti-Aircraft Service. Somebody else is advising the Royal Flying Corps. You have West Kent cyclists riding about in all directions over the whole country. It is turned into a sort of comic opera, and yet we wonder how these fellows get back.

COMPENSATION.

I know four people in my Constituency whose houses were blown about their heads before there was any question of insurance whatever. They cannot get a penny of compensation; and the wives of men who were killed in Zeppelin raids cannot get a penny compensation. If we had put up a fight against Zeppelins, against these raids, if the defence against them had not been a criminal disgrace, both in the political and military administration of the defensive organisations of this country, it would be bad enough to leave these people destitute and injured by an act of the enemy.

But when we remember that during the period I am speaking of, when for months and even years the only advice we could get out of the military authorities, and the gospel which was preached by every subsidised paper in the country, was "darkness and composure," and when any man who raised his voice and demanded a proper system of defence was charged with playing the German game, then I ask what consolation is it for a man who has been an honest, honourable citizen, who has paid his taxes and paid his way, most probably the very man who got hot and excited over all the elections, the khaki election, the "we won't wait" election, and most probably sacrificed his tea

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to go out and vote in favour of "eight battleships," what satisfaction is it to know that the amount of protection which he gets is that he is allowed to be killed and his wife and children are left to starve by an incompetent Government?

I shall never cease, so long as I remain a Member of this House, to press on the Front Bench the necessity of realising their obligations to the citizens of this country. If there were enough of them it would be all right. When it comes to soldiers' and sailors' pensions, and there are enough to make a row, something is done. If 10,000 people were injured they would get compensation. It would be worth the while of half a dozen Members to take up the case. But when there are only ten or twelve, or 100 or 150, they do not count at all. Besides, probably half of them may be half-witted and they could not be relied on to vote for the Member even if he did take up their case.

It must not be a question of the amount of pressure that a Member can bring to bear on the Government as to whether it shall be done or not, but it must be purely a question of justice—whether these victims are justly entitled to compensation or are not.

My noble friend, the late chairman of the Kitchen Committee, stated at a meeting held only yesterday with reference to dogs that he had thirteen dogs, and that he was not going to have them sacrificed in the way proposed. They must combine and organise the country, and make themselves a nuisance, and by doing that they would save the dogs. There are more dog owners in this country than there are victims of the air raids, and it is possible that they will be more successful in enforcing their wishes. It will be interesting to note as a point of purely political history whether or not the dog owners' agitation succeeds in its object, while the hundreds of citizens who are the victims of inefficient defence fail to get common justice.

I do not see the representative of the Admiralty in his place, and there are only a few faithful Members interested in the defence of the country sufficiently to keep them here to-night, but another question to which I should have liked to call the attention of the representative of the Admiralty, if he had been here, is whether it would not be possible to have one person commanding at Dunkirk, giving him a free hand to locate and destroy any enemy squadrons which attempted to mobilise for the purpose of initiating a raid on England within forty or fifty miles of Dunkirk. We could hold him responsible for any squadrons which sought to initiate raids within that area, and the more we can drive them back the better it will be for this country—so far as these raids are concerned.

Mr. R. McNeill: The hon. Member who has just sat down has twice, in the course of his speech, commented upon the paucity of the attendance, and the few Members sufficiently interested in the air defence of the country to be present at this Debate. I hope that the hon. Member will not be offended when I say that, in my opinion, probably the paucity of the attendance is due to the fact that there are possibly few Members of the House who take quite the same view of the hon. Member's qualifications for giving it advice. I have listened to his speech and to previous speeches of his on the subject, and I confess that I am very sceptical on that point.

My own reason for rising is not to discuss the hon. Member or his advice as to how the war ought to be ended, though it may, of course, have some value, or may not, nor to discuss the advice he has given to the Government with regard to their defence. The only reason why I rise is that, in the absence of the hon. and gallant Member for Hythe (Sir P. Sassoon), I am, in a sense, doubly representing the people who suffered from this air raid to which the hon. Member has referred. I want to tell the House that I have been in close communication with the local authorities and other persons in that locality and they are not in the least panic-stricken; they have not in the least lost their heads; and they are not at all inclined to make any unreasonable demands upon the Government.

Mr. Billing: I should like to point out to the hon. gentleman that, so far from suggesting that any panic existed amongst the people, the suggestion I made was that each town is now adopting its own method of warning. In some they do so by ringing bells.

Mr. McNeill: I do not know why I should think I am not entitled to tell the House that these people are not panic stricken because the hon. Member did not refer to the point. I did not suggest that he did. The hon. gentleman has given us a description of the sort of warnings which he says are prevalent in East Kent. If I may say so without the use of many words, his description is sheer nonsense, as nothing of the kind occurs, and the idea of a town crier going about ringing bells is a thing that does not occur.

At the same time I should like to tell the Under Secretary that I think there is a case for improvement in the methods of warning, and although I am not going now to put any criticisms before my hon. friend, or ask him for any assurances, I should like to tell him that there is a certain amount of dissatisfaction in Folkestone and the neighbourhood, and that there is, at all events, an interrogative state of mind existing there, and anxiety to know whether the best that can be done is being done, and a desire to put before the Government

certain points on which the people feel doubtful as to whether an improvement could not be effected.

I hope within the next few days to be able to bring some of the leading people from that neighbourhood into communication with a Member of the Government. I do not know if the hon. gentleman who has just spoken thinks I should have been better advised to have requested him to receive the deputation, in order that we might have the benefit of his advice before going to the Government.

Mr. Billing rose—

Mr. McNeill: As the time is short, I am afraid I cannot give way.

Mr. Billing: Then why occupy the time in making remarks intended to be funny?

Mr. McNeill: Perhaps I may be allowed to be my own judge of that. I only wish to tell the hon. gentleman opposite that I hope to have the opportunity of entering into closer relations on the subject, and I think that is the reasonable way of doing it, and the better way of doing it than levelling criticisms on the spur of the moment, until the facts are more fully known either to myself or the hon. Member. When that time comes, I hope that he and those with whom he is associated will be ready to give a patient hearing and be willing to admit that, however effective they may think the arrangements are in several respects, there is very considerable room for improvement, and we hope that that improvement will be effected.

[All of which is simply heavily diluted P.B. with oil on top.]

The Under Secretary of State for War (Mr. Macpherson): I think that nothing could have been fairer than the statement of the case for the inhabitants of Folkestone which has been made by my hon. friend (Mr. McNeill). He has not exaggerated the case, and he has told us that in a few days he is to represent the position by a deputation or otherwise of the inhabitants of that part of Kent with which he is associated, directly or indirectly, before the Government through its representatives. I happen to know a little about this particular raid, and I think that when that hon. Member states that there is anxiety and dissatisfaction, he is giving an accurate statement of the case.

To say, as the hon. Member for East Herts (Mr. Billing) said, that there was "destruction and devastation," is not strictly accurate. Our sympathy goes out to the homes of the stricken and to the friends of those who have been lost, but when the hon. Member talks about destruction and devastation—

Mr. Billing expressed dissent.

Mr. Macpherson: I have taken down the hon. Member's words, and he was referring very distinctly to the Folkestone raid. To call it destruction and devastation is really an exaggeration, which I am afraid my hon. friend is sometimes given to when his enthusiasm carries him away.

I would like to take this opportunity of extending on the part of the Government to the inhabitants of Folkestone their sincere sympathy, and the assurance, and I have it on the very highest authority, that everything that is possible will be done, and really has been done in the past, to defend those vulnerable points on the South-East coast which are daily in danger of attack from the air.

The hon. Member for East Herts told us that the finest form of defensive operations lies in the offensive. I am not going through his speech as a whole, and I do not at all object that he makes it, but when he says that the finest form of defensive lies in the offensive, I would like to tell him that that is exactly what has happened. As my right hon. friend the Chancellor of the Exchequer pointed out in his reply to a question by private notice, within the last five weeks we had twenty-four reprisal raids upon Zeebrugge and within the last five days six raids on Zeebrugge in the way of reprisal.

[All very well, but aeroplanes intended for raids on England do not concentrate in the docks at Zeebrugge.]

Mr. Billing: Are we to understand that in the event of the Germans stopping their raids in this country, we shall stop raids on Zeebrugge?

Mr. Macpherson: Not at all.

Mr. Billing: Then they are not reprisals.

Mr. Macpherson: I am only trying to point out in my own quiet way that my hon. friend was really contradicting himself. We have at the present time the most gallant men in the world flying, with really magnificent machines, who are doing work of which we can hardly estimate the value in this country, and are inflicting on the Germans almost daily "Folkestone raids," which are really doing as much to break down the moral of the people of Germany as any part of our fighting forces could possibly do.

[Pardon me, Mr. Macpherson. We are raiding Belgian towns, not German towns, and we are not touching "the people of Germany" at all.]

It is all very well for my hon. friend to stand up in this House and ask why we are not ready to meet an attack, and to draw a vivid picture of these aeroplanes concentrating in a certain part of Flanders, while in another part of his speech he says that there were only ten or a dozen aeroplanes. My hon. friend knows perfectly well that it does not require a concentration of ten or



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a dozen aeroplanes, for that is the normal number of aeroplanes which one may find in any given station either in Flanders or Germany or this country. Consequently the drawing of this picture, for the purpose of his argument, of the assembling of these in a certain part of Flanders for attack is really asking the House to believe too much. While my hon. friend was talking about what these aeroplanes were doing, our own aeroplanes were doing quite as well at the same time at another place.

[Name the place in Germany, please.]

My hon. friend asks if I can give him an assurance that the defence of these shores is in competent hands. I can assure him that the Government is satisfied with the competence of those who have charge of this matter. As a matter of fact, it is not absolutely necessary for the officer in chief command of Home Defences to be a specialist in every branch of Army work. If it were, it would be impossible to get any Commander-in-Chief.

I do not know what justification my hon. friend had for the statement as to the court-martial in connection with the raid.

Mr. Billing: I only asked the question.

Mr. Macpherson: Very often questions are asked without sufficient inquiries being made, which means that the question is merely a statement put in the form of a question. I do not think my hon. friend has any justification for asking his question or for suggesting that a court-martial has taken place. The implication is that these two gallant officers were court-martialled either for neglect of duty or cowardice.

Mr. Billing: No!

Mr. Macpherson: Then what was it?

Mr. Billing: I understand from the information I have had that these two officers requested permission to go up when the enemy was sighted, and that they could not get that permission. There was a considerable amount of dissatisfaction, and that

they were put under arrest for insubordination. They were, it is said, only too anxious to fight.

Mr. Macpherson: The two officers asked to be allowed to fight the enemy and were not allowed to do so?

Mr. Billing: Yes.

Mr. Macpherson: I do not know on what basis the question was framed, but it seems to me highly improbable that anything of the kind happened. However, my hon. friend has asked me to make inquiries, and I will do so.

In regard to the question of compensation, it really, perhaps, did not arise out of the question asked by the hon. friend this afternoon. But my hon. friend probably knows that the Government instituted a very cheap and reasonable insurance scheme. For a small payment anyone can have their property insured against any damage by hostile aeroplanes. I have made no attempt to follow my hon. friend into his matters of strategy or military history, or the various personal events to which he has referred, but I hope that I have answered every single point which really did arise in the questions asked by him.

[Parliamentary work is a funny business, but we seem to be getting along, so far as aerial affairs are concerned. The War Office, particularly, is to be congratulated on having in Mr. Macpherson a representative who is not merely a straight Parliamentarian, but a gentleman. He treats all questions with due consideration, and without either sneering contempt or unseemly levity, as has been the habit of some of his predecessors. In fact, Mr. Macpherson and Sir Edward Carson seem to be the brightest discoveries of the present Government, which is in itself a healthy omen as showing that our two great Services are at last in capable hands. A considerable amount of Parliamentary matter of a later date has been held over until next week.—C. G. G.]

STANDARDISATION OF COPPER TUBES FOR AIRCRAFT.

The Air Board desires the Aircraft Industry to note the following:—

Difficulties having been experienced by aircraft contractors in obtaining supplies of copper tubing, the causes were investigated, and they were found to be (1) the great variety of sizes called for; (2) the fact that tube makers received orders very irregularly and for small quantities.

Arising out of the investigation, the Specification Committee of the Air Board has decided that, in future, copper tube for aircraft contracts will be specified in terms of external diameter and legal Standard Wire Gauge.

As far as possible, tubes of 20 gauge (0.036 in.) will be used, to the exclusion of all other thicknesses. Where, for special considerations, it is desirable to use other thicknesses, the choice will, as far as possible, be restricted to gauges 16, 18, and 22. The last-named is difficult to manufacture, and will be avoided as far as possible.

A new Air Board Specification for copper tube will shortly be issued, and will have as an appendix the following list of sizes and gauges which the Air Board regard as standard:—

22 gauge: 1 in., 1½ in., 1¾ in., 1⅞ in., 1⅞ in., 1⅞ in., 2 in.
20 gauge: 3/16 in., 1/4 in., 5/16 in., 3/8 in., 7/16 in., 1/2 in., 5/8 in., 3/4 in., 1 in., 1½ in., 1¾ in., 1⅞ in., 1⅞ in., 1⅞ in., 2 in.

18 gauge: 1 in., 1¼ in., 1½ in., 1¾ in., 2 in.
16 gauge: 1/2 in., 5/8 in., 3/4 in., 7/8 in., 1 in., 1¼ in., 1½ in., 1¾ in., 2 in., 2½ in.

[If one may be permitted to make a comment, it is that the Air Board has been, if anything, too generous in the number of different sizes and gauges permitted.—C. G. G.]

A MEMORIAL.

The following notice has appeared in the public Press:—

CITY OF NOTTINGHAM.

Public memorial to the late Flt. Comdr. Capt. Albert Ball (D.S.O., M.C., Croix de Chevalier Legion d'Honneur, Russian Order of St. George).

The City Council has at my suggestion unanimously concurred in the proposal that a public memorial in the form of a statue of the late Capt. Albert Ball, Britain's foremost aviator, should be erected in the historic Great Market Place or some other suitable place in his native city in recognition of the distinguished services which he rendered to the Empire as a member of the Royal Flying Corps and as a token of the esteem and admiration of his fellow-citizens and fellow-countrymen.

I am sure this proposal will be most heartily approved, and I beg to appeal for subscriptions to a fund which I have opened for the purpose, and to ask that all contributions be sent to the Town Clerk, Guildhall, Nottingham.

J. E. PENDLETON,

Mayor of Nottingham.

June 4th, 1917.

PRESENTATION AEROPLANES.

The Secretary for the Colonies announces that the £10,000 contributed by the Government of the Gambia for the purchase of fighter aeroplanes is to be divided equally between the Royal Flying Corps and the Royal Naval Air Service.

THE FLYING BOOK.

A handy book of reference, which should be in the hands of all who are concerned with aircraft, either politically, scientifically, or industrially, or even as Service aviators, is "The Flying Book," edited by Mr. W. L. Wade, who has produced an excellent piece of work despite his onerous duties as sub-editor of THE AEROPLANE, and the difficulties of war-time.

"The Flying Book" first appeared in 1914, but lapsed owing to the war, and has only now been revived. The necessity for observing, both in the letter and in the spirit, the various regulations for the Defence of the Realm have admittedly cramped the editor's style, or rather his available store of information, but none the less there is much information of value in the book.

The first part of the book consists of informative articles, such as "Aeroplanes in War," "Naval Aeronautics," "Aeroplane Design and Construction," "How to Control an Aeroplane," "Aero Engines," "Airships," and "Kite Balloons."

Following these is a section devoted to "Modern Aeroplanes," briefly describing and illustrating some 75 different types of machines. After this is an "Historical Section," showing nearly 50 of the machines which have helped to make history. And after this come 30 aero-engines. These sections are excellently illustrated with sketches in black and white by Mr. Geoffrey Watson, whose work is well known to readers of this paper.

A table of records completes the first part.

The second part of the book contains a list of the world's various aeronautical organisations, a comprehensive directory of the Aircraft Industry—at any rate, the British, American, French and Italian part of it. The second part finishes with an aeronautical "Who's Who," which bears witness to an intimate knowledge of people concerned with aircraft, but is marred by several misprints.

The third part deals with Naval and Military Aviation, the Honours List of the Flying Services, the work of Zeppelins, a review of aeronautics in 1916, a list of aeronautical publications, a glossary of aviation terms, and a useful set of tables, such as conversion tables between British and metric measures, weights and strengths of metal and timber, and so forth.

Altogether Mr. Wade is to be congratulated on his work, and one can honestly say that the book, which is priced at 3s. 6d. net, and can be had, post free, for 4s. from the Wm. Dawson Publishing Co., 2, Breams Buildings, E.C.4, is remarkably good value for the money.—C. G. G.

THE FOLKESTONE RAID.

The body of a German who was in one of the aeroplanes brought down in the sea has been recovered and landed at a coast town.

The funeral of the aviator who was captured alive and afterwards died took place last week. His companion, the observer, is still in hospital.

ANOTHER ESCAPE.

It was reported from Berne that Capt. A. J. Evans, R.F.C., and Lieut. S. E. Buckley, Northamptonshire Regt., attached R.F.C., arrived on June 9th, having escaped from Germany.

These two officers were officially reported missing—Capt. Evans on July 25th, 1916; and Mr. Buckley on Dec. 7th, 1915. These officers are to be congratulated on their skill and ingenuity. Having entered neutral territory on other than a war-like mission, it is to be assumed that they cannot be interned.

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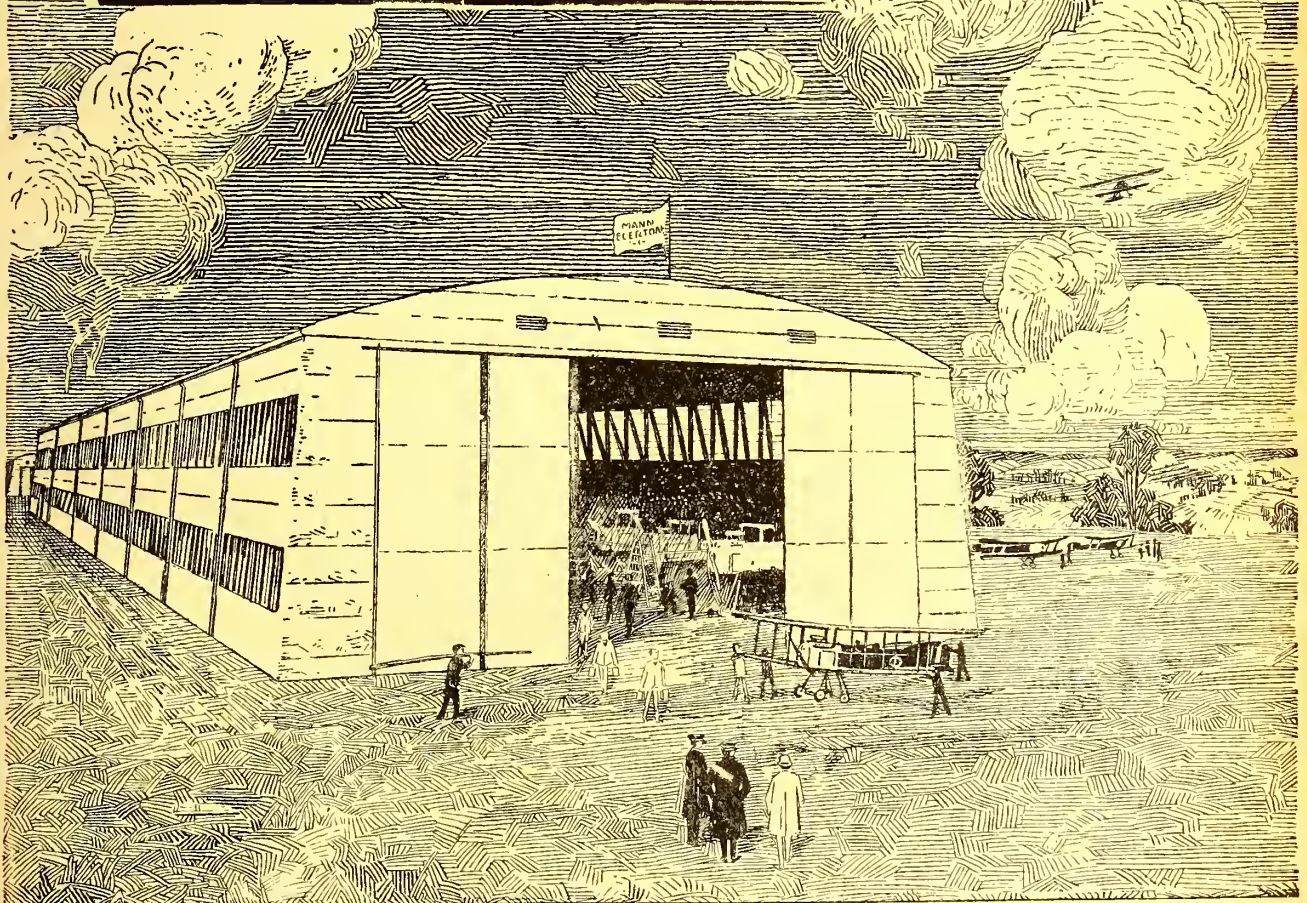
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AERIAL STRENGTHS AFTER THE WAR.

BY "BERKELEY."

Since the days when Cardinal Alberoni first propounded as a definite political principle the theory of the Balance of Power, the undue prominence of any nation or any group of nations has been curbed by a counter alliance of other great nations. Alliance is answered by alliance, preparation by preparation. Theoretically it has been unnecessary for any Power to resort to excessive armament as an insurance of national security, as aggression from a restless neighbour would rouse other nations into defensive measures. Thus would peace be preserved. But in practice the maintenance of a Balance of Power has not brought peace, and has not even greatly reduced the number of warlike efforts.

All nations having great possessions are in a position of eminence which, as in the case of individual human success, rouses neighbourly jealousy to a degree which robs industry of much of its rewards by the consequent reduction in security. A great empire requires great expenditure on defences. Its very success denies it the help of protective alliances in that no smaller nation cares to take the risk of being embroiled in the many troubles habitual with the country of numerous colonies.

THE TWO-POWER STANDARD.

Great Britain, the central government of the greatest empire the world has yet known, is dependent for existence on the maintenance of the command of the sea. She has had during the past century to make preparations to repel naval attack on the part of any other nation or group of nations.

It has not been enough to maintain a navy equal in size to that of her greatest rival. She has had to build and equip a fleet capable of engaging in battle on favourable terms the navies of the two next largest Powers in the Concert of Europe.

Asiatic Powers have only recently had to be taken into account, as an effective alliance between an Asiatic and a European race has until late years been an accepted impossibility. But this great force has not only been for defensive purposes, but has existed that the national will might be enforced. Might is cleaner in its results than is arbitration.

GERMANY'S RISE.

The next greatest nation—Germany—only came into corporate existence as a result of the wars against Austria in 1866 and France in 1870. She, too, made adequate military preparations against possible attack from jealous neighbours, and also that she might not be found wanting in the struggle for dominance which must ultimately have come between Great Britain and herself. The Germans were unable to see the logic in the desire of Great Britain to have a navy based on a two-power standard or to appreciate the essential moral right invigorating all British national action.

THE POPULAR VIEW.

A nation's armed forces should be of sufficient strength to protect her from aggression and to permit of her holding her own in international debate. But national armaments are not beloved of the people. An army is thought to be a dangerous weapon in the hands of the rulers, and is at the same time a cause of apparently unproductive expenditure.

To give some measure of attraction to the defences of a country in the minds of a democracy, inherently stupid as it is, it has been necessary for politicians to speak of international standards of power, that concrete expression may be given to the policy of the governing classes.

MAINTENANCE OF SUPERIORITY.

It has been possible to maintain a two-power standard in the British Navy owing to the elements of time and money in naval construction. A Super-Dreadnought cannot be built in a few days nor can its cost be measured in hundreds of pounds. Thus, no nation can suddenly and in secrecy make such increases to its navy as would immediately upset any standard of power in use at the time.

Therefore, it has been possible to wait until rival nations have made their plans before preparing counter-plans. When once the superiority is gained its maintenance is not difficult.

THE AIR SERVICE ARGUMENT.

But the principles applying to the comparative strengths of navies are not of the same weight when used in reference to the Air Services of the Powers. The importance of the aeroplane and the airship in international politics cannot now be underestimated. A vast preponderance of aircraft in the armed forces of any nation as compared with any rival power would give that power a great initial advantage in any future war.

In the present decade it can even be said that a preponderance of military and commercial aeroplanes over those of other powers would be of vital importance to a country whose navy and army are of normal efficiency and dimensions. But any attempt to base our aerial forces on a two or three-power standard will not lead to an economical state of preparedness.

A PERFURVED IMAGINATION.

In their present stage of development aircraft are expensive, even in the case of the large Zeppelins, and can be produced in great numbers in a short space of time, provided that adequate preliminary arrangements are made. No standard would remain constant for more than a few months at a time. Moreover, any such proportion as an equality with the next two greatest powers in aircraft alone might lead to an absurd imminence.

A nation possessed of an imagination gilded with the dreams of her who told tales on a thousand and one nights to lull the criminal propensities of a Sultan jaded with the splendours of life, would conceivably spend its hardly earned revenues on a vast air fleet, whilst the essential army and navy on the common earth were consistently neglected. In this case, the Flying Corps of Britain, under a two-power standard, would be in size an eighth wonder of the world and the sovereign democracy might starve.

PROPORTIONATE REPRESENTATION.

First of all, it is necessary that the Army and the Navy should be maintained at such a strength as would permit of successful offence in case of the outbreak of war. The lessons of this war, properly read, will indicate the proper proportions of aircraft to the establishment of the two Services. The whole defences, not merely the aerial arms, of the country should be based on a standard relating to foreign forces.

RESERVES.

But the peace establishment of an army or even of a navy is much smaller than that available in war. A large proportion of those who are engaged to fight the country's battles are normally on a reserve, and are engaged in the vocations of civil life. Reservists proper have all served with the colours, and have a thorough



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knowledge of military life. A further reserve is obtained from the Territorial Force, drawn from interested amateurs of war. This personnel is partly trained, and can be rapidly brought to a state of efficiency. Similarly in the Navy there are several categories of reservists, included in which are those drawn from the Merchant Service—a very valuable asset in these present times of trouble.

MATÉRIEL CONSIDERATIONS.

The position in regard to matériel is somewhat different. The supply of rifles, for instance, should be maintained at a figure large enough to meet all requirements in the first few months of war. So, too, with shells and other means of spreading death. It is only with such sections as transport that a reserve can be created of matériel which is in use in commercial hands.

The aeroplane of commerce for some time to come will not differ essentially from the types in use in the Army and Navy. Fighting aeroplanes have no armour, nor are they designed in any special manner, giving them peculiarly military attributes. Thus the aircraft engaged in the carriage of mails or passengers may be swiftly diverted in times of trouble to a more serious occupation in the defence of the country. Therefore it is necessary, in estimating the aerial strength of a country, to include all aircraft of a certain degree of efficiency, whatsoever may be its employment in times of peace.

If Germany or any other nation which may become our rival in the future has a relatively small air fleet in its armed forces and a very large number of privately owned aircraft, the latter class must be taken into account in any estimate of aerial strength which may be compiled. The military value of commercial aircraft will decrease as the lines of divergence increase with future developments of design and construction, but present needs require present remedies.

LORD MONTAGU ON AIR TRAFFIC.

Readers are reminded that Lord Montagu of Beaulieu, who has recently returned from India, will lecture at the Central Hall, Westminster, on Thursday of next week, June 20th, on the subject of "The World's Air Routes and their Regulation."

The lecture will begin at 8 p.m., but people are advised to arrive by 7.45 p.m. to secure seats. Tickets may be obtained free from Lord Montagu at 62, Pall Mall, S.W., or from Mr. W. Barnard Faraday, Secretary of the Aeronautical Society, 7, Albemarle Street, W.1.

Few people know the geography of the world from personal experience better than does Lord Montagu, and when one couples his knowledge of aviation to his knowledge of topography, it would be hard to find one better qualified to discuss the details of Air Lines and the regulation of traffic thereon. Moreover, his experience of international politics, gained in the House of Commons as well as in the House of Lords, fits him peculiarly to deal with international air traffic.

It is, one gathers, his intention to deal with long distance journeys in detail, setting forth a scheme of necessary regulations, and practical time-tables for journeys from England to such distant parts of the globe as China, India, and South Africa. He will also demonstrate how meteorological services have shown that certain reliable winds will assist regular services all over the world.

The lecture will be well illustrated by large-scale maps, photographs, and diagrams, and all those who are interested in the future of aviation after the war should make a point of being present.

LORD NORTHCLIFFE'S ABSENCE.

The War Cabinet have invited Lord Northcliffe to go to America to co-ordinate the work of the several British missions that are already established there, and to continue the task so successfully initiated in that respect by Mr. Balfour.

Lord Northcliffe has accepted this invitation, and has already sailed for the United States.

[One hopes that Lord Sydenham will act as Chairman of the Civil Aerial Transport Committee during Lord Northcliffe's absence.]

From the "Daily Express" of June 12th:—

Lord Northcliffe's departure from the Air Board to his new post in America was somewhat dramatic. From the chair

RESERVES OF PILOTS.

As aircraft of present types can be produced with great speed if the means of construction are available, the most urgent necessity in preparing for aerial forces in wars of the immediate future is the formation of a large reserve of properly trained flying personnel.

Good pilots and mechanics cannot be trained in a day or as an afterthought. Hurried training is expensive in both money and men. There will, it is true, be a large class of aviators and aeronauts engaged commercially, from which a reserve can be formed, but few of these, unless detailed arrangements are made, will possess that military knowledge which will become more and more essential as the days pass by.

WHERE THE STANDARD ARISES.

It is in this connection that a standard of aerial strength can be maintained. If a jealous neighbour possesses relatively few aeroplanes, but a large trained personnel, it will be necessary to train in the British Empire a considerably larger number, that in the time of trial we shall not be found wanting.

Briefly, it is necessary that Great Britain shall have sufficient aeroplanes in use and in reserve for the requirements of her armed forces and for the proper defence of the country. It is also necessary that some form of subsidy shall be brought into effect by which the commercial aeroplanes of a definite standard of efficiency shall be at the service of the country on the outbreak of war. It is, above all, essential that personnel in very large numbers shall be trained for service in the aerial arms of the country's forces. There is little objection to the personnel thus trained being in a reserve based on a two-Power standard.

The means of construction should not be neglected. A healthy aeronautical industry is one of the greatest safeguards possible to a country in the future.

he announced to his colleagues in a few sentences the new call that had been made on his energies, tendered his resignation, and immediately left the room and the Board. Major Baird, M.P., the Parliamentary Secretary of the Board, at once took the vacant chair. The mantle of Elijah, in all its voluminous folds, descended on his much more spare personality, but he endeavoured to extend himself to fill the post with great success.

[The Editor of THE AEROPLANE accepts no responsibility for the accuracy of these allegations, especially as Lord Northcliffe is not, and never has been, a member of the Air Board.]

THE PARLIAMENTARY AIR COMMITTEE.

Mr. Joynson-Hicks, M.P., chairman of the Parliamentary Air Committee, and Sir Charles Nicholson, M.P., have returned from an extended visit to the Royal Flying Corps in France. They made an exhaustive investigation into the position regarding machines, and will report confidentially to the Air Board and to the Parliamentary Air Committee.

AERIAL TRANSPORT.

It was reported from Rome on June 10th that in co-operation with people concerned with aviation in England and France an International company for aerial transport has been formed in Italy. The company proposes to establish aerial services for passengers and parcels in Italy, Sicily, Sardinia, Corsica, the Riviera, Egypt, Tunis, Barcelona, Albania, the Aegean Isles, and later Trieste, Dalmatia, Istria, and Asia Minor.

The names of the British and French participants are not made known.

THE THAMES AIR RAID.

A coroner's inquiry was opened on June 7th relative to the deaths of three men killed in the aeroplane raid over the Thames estuary. The coroner stated that there were 10 victims, but in seven cases he was empowered to give death certificates.

A police official, giving evidence, said that the enemy aircraft squadron came from an easterly direction at an altitude of 14,000 ft., dropping about 40 bombs. He saw one raider brought down by gunfire. Two of the victims were killed, and a third, who was struck by a bomb falling in the centre of the road, died six hours later.

A verdict that the deaths were due to the explosion of bombs dropped by enemy aircraft was returned.

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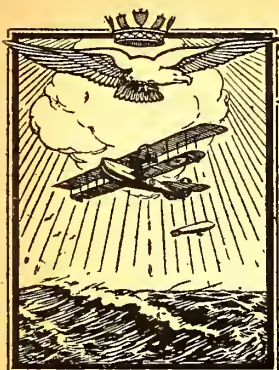
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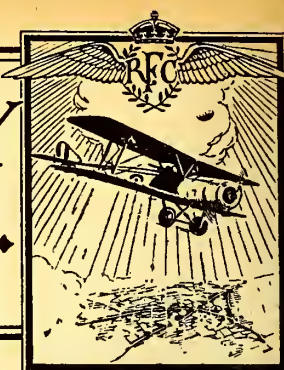
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FROM THE "LONDON GAZETTE."

From the "London Gazette" Supplement, dated June 2nd.

The King has been pleased to award the following decorations to the undermentioned N.C.O.s. and Men for their services during the war:—

THE DISTINGUISHED CONDUCT MEDAL.

1660 Flt. Sgt. G. Greenfield, R.F.C.
279 Flt. Sgt. (Actg. Sgt. Maj.) C. E. King, R.F.C.
1908 Cpl. E. Langridge, R.F.C.
Sgt. T. J. Mountford, R.F.C.
6729 1st Cl. Air Mech. E. Rogers, R.F.C.

THE MERITORIOUS SERVICE MEDAL.

16796 Flt. Sgt. W. Anderson, R.F.C.
266 Flt. Sgt. (Actg. Sgt. Maj.) J. A. Aspinall, R.F.C.
0682 Cpl. T. A. Bates, R.F.C.
1087 Flt. Sgt. (Actg. Sgt. Maj.) C. W. Brown, R.F.C.
950 Actg. Sgt. Maj. C. E. H. Bunting, R.F.C.
291 Sgt. (Actg. Sgt. Maj.) J. F. Clarke, R.F.C.
2131 Flt. Sgt. H. Cooper, R.F.C.
1576 Sgt. G. H. Hall, R.F.C.
89825 Sgt. (Actg. Sgt. Maj.) R. W. Harrison, R.F.C.
1374 Flt. Sgt. G. Jappe, R.F.C.
4254 Flt. Sgt. J. W. Kellett, R.F.C.
10942 Flt. Sgt. E. A. Lane, R.F.C.
59 Flt. Sgt. J. Longhurst, R.F.C.
6262 Cpl. T. H. Moore, R.F.C.
1085 Flt. Sgt. (Actg. Sgt. Maj.) M. O'Connor, R.F.C.
4234 Flt. Sgt. H. Peters, R.F.C.
26950 Sgt. H. H. Ridley, R.F.C.
5444 Flt. Sgt. W. Thomason, R.F.C.
2507 Flt. Sgt. C. Trevett, R.F.C.

* * *

WAR OFFICE, June 5th.

REGULAR FORCES.—STAFF.—SPECIAL APPOINTMENTS.—Graded for pay as Staff Capts. whilst commanding Squadrons, R.F.C. Officer Cadet Wing.—Temp. Capt. J. Robertson, attd. R. Scots, and to be transf'd. to Gen. List, vice Capt. R. B. Neill, Res. of Officers, Jan. 27th, 1917. Capt. R. H. C. Routley, R. Fus., and to be sec'd., vice Capt. H. W. Sewell, Bord. R., Spec. Res., April 24th, 1917.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Balloon Co. Comdr.—Graded as a Sqdn. Comdr.—Lt. (temp. Capt.) V. A. Beaufort, Devon R., from a Balloon Co. Comdr. (graded as a Flt. Comdr.), and to be temp. Maj. whilst so empld., May 19th.

Adj't.—Temp. Sec. Lt. (temp. Lt.) F. Jefcoate, Gen. List, from an Equipment Officer, 3rd Cl., March 15th.

TERRITORIAL FORCE RESERVE.—Lt. J. B. Jackson, from R.D.C., to be Lt., and to be actg. Adj't., whilst empld. with R.F.C., May 30th.

* * *

WAR OFFICE, June 6th.

REGULAR FORCES.—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Park Comdr.—Sec. Lt. (temp. Capt.) H. R. Vagg, Som. L.I., from an Equipment Officer, 1st Cl., and to be temp. Maj. whilst so empld., May 1st.

* * *

WAR OFFICE, June 7th.

REGULAR FORCES.—STAFF.—Graded for pay as Staff Lts., 3rd Cl.—Sec. Lt. (temp. Lt.) F. D. Murphy, A. Cyclist Corps, from R.F.C., March 20th.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Equipment Officer, 1st Cl.—Lt. J. M. Furnival, Spec. Res., from the 2nd Cl., and to be temp. Capt. whilst so empld., May 8th.

* * *

WAR OFFICE, June 8th.

REGULAR FORCES.—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Special Appt.—Graded as a Flt. Comdr.—Capt. R. H. D. Lee, Norf. R., T.F., from a Flying Officer, May 16th.

Adj't.—Lt. H. P. S. Clogstoun, Spec. Res., from a Flying Officer, April 14th.

TERRITORIAL FORCE.—R.G.A.—Capt. to be Maj.—Capt. (temp. Maj., R.F.C.) L. Jenkins, M.C., with precedence as from June 1st, 1916, and to remain sec'd., Sept. 20th, 1916.

TERRITORIAL FORCE RESERVE.—Maj. C. A. Walker-Leigh, from R.F.C., to be Maj., with precedence as from Sept. 25th, 1914, April 21st.

* * *

WAR OFFICE, June 9th.

REGULAR FORCES.—ESTABLISHMENTS.—R.F.C.—MIL. WING.—Flt. Comdrs.—And to be temp. Capts. whilst so empld.—Lt. J. Mitchell, M.C., R.A., from a Flying Officer, April 19th. Sec. Lt. (temp. Lt.) D. F. Stevenson, Yeo., T.F., from a Flying Officer, May 23rd.

MEMORANDA.—The following to be temp. Sec. Lts. for duty with R.F.C.:—Sgt. H. L. Marvin, from R.F.C., April 16th. J. H. Moore, May 12th.

* * *

The King has been graciously pleased to approve of the award of the Victoria Cross to the following Officers, Non-Commissioned Officers, and Men:—

Lt. (temp. Capt.) Albert Ball, D.S.O., M.C., late Notts and Derby R., and R.F.C.

For most conspicuous and consistent bravery from April 25th to May 6th, 1917, during which period Capt. Ball took part in 26 combats in the air and destroyed 11 hostile aeroplanes, drove down two out of control, and forced several others to land.

In these combats Capt. Ball, flying alone, on one occasion fought six hostile machines, twice he fought five, and once four. When leading two other British aeroplanes he attacked an enemy formation of eight. On each of these occasions he brought down at least one enemy.

Several times his aeroplane was badly damaged, once so seriously that but for the most delicate handling his machine would have collapsed, as nearly all the control wires had been shot away. On returning with a damaged machine he had always to be restrained from immediately going out on another.

In all Capt. Ball has destroyed 43 German aeroplanes and one balloon, and has always displayed most exceptional courage, determination, and skill.

Lt. Frank Hubert McNamara, Aus. Forces, R.F.C.

For most conspicuous bravery and devotion to duty during an aerial bomb attack upon a hostile construction train, when one of our pilots was forced to land behind the enemy's lines.

Lt. McNamara, observing this pilot's predicament, and the fact that hostile cavalry were approaching, descended to his rescue. He did this under heavy rifle fire, and in spite of the fact that he himself had been severely wounded in the thigh.

He landed about 200 yards from the damaged machine, the pilot of which climbed on to Lt. McNamara's machine, and an attempt was made to rise. Owing, however, to his disabled leg Lt. McNamara was unable to keep his machine straight, and it turned over. The two officers, having extricated themselves, immediately set fire to the machine and made their way across to the damaged machine, which they succeeded in starting.

Finally, Lt. McNamara, although weak from loss of blood, flew this machine back to the aerodrome, a distance of 70 miles, and thus completed his comrade's rescue.

* * *

WAR OFFICE, June 11th.

REGULAR FORCES.—STAFF.—The following temp. appts. are made at the War Office:—Dep. Asst. Dir.—Capt. (temp. Maj.) F. A. Wanklyn, M.C., R.A., from a Sqdn. Comdr., R.F.C., and to relinquish his temp. rank, May 1st.

Staff Lt.—Lt. L. W. W. Lees, Antrim R.G.A., Spec. Res., from an Equipt. Officer, 3rd Cl., R.F.C., May 1st.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Sqdn. Comdrs.—From Flt. Comdrs.:—Maj. A. J. Ross, D.S.O., R.E.; Capt. V. A. Albrecht, M.C., Manch. R., and to be temp. Flt. Maj. whilst so empld., May 16th.

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Flt. Comdrs.—From Flying Officers, and to be temp. Cpts. whilst so empld.:—Temp. Sec. Lt. C. G. Eccles, Gen. List, May 3rd. Lt. F. McD. C. Turner, Spec. Res., May 7th. Temp. Lt. C. A. Bourne, Gen. List; Temp. Sec. Lt. W. G. Barker, M.C., Gen. List, May 9th. Sec. Lt. A. Coningham, Spec. Res., May 10th. Sec. Lt. (temp. Lt.) T. M. Southorn, R.F.A., T.F., May 11th. Lt. J. R. Anthony, R.W. Fus., T.F., May 13th.

Equipt. Officers, 1st Cl.—From the 2nd Cl., and to be temp. Cpts. whilst so empld.:—Sec. Lt. (temp. Lt.) D. Hodgson, Cyclist Bn., T.F., April 25th. Sec. Lt. (temp. Lt.) F. E. Pike, Spec. Res.; temp. Lt. A. E. Biscoe, Gen. List, May 1st.

FROM THE COURT CIRCULAR.

BUCKINGHAM PALACE, June 6th.

The following had the honour of being received by the King, when His Majesty invested them with the Insignia of Companions of the Orders into which they have been admitted:—

THE DISTINGUISHED SERVICE ORDER AND BAR.

Captain Stuart Grant-Dalton, Yorkshire Regt. and R.F.C.

THE DISTINGUISHED SERVICE ORDER.

Major Arthur Ross, Royal Engineers and R.F.C.

The King then conferred decorations as follows:—

BAR TO THE DISTINGUISHED SERVICE CROSS.

Flight Commander Roderick Dallas, R.N.A.S.

THE DISTINGUISHED SERVICE CROSS AND BAR.

Flight Lieut. Robert Little, R.N.A.S.

THE MILITARY CROSS AND BAR.

Major Leoline Jenkins, R.F.C.

THE MILITARY CROSS.

Captain James Leith, Hampshire Regt. and R.F.C.

Sec. Lieut. Oswald Hills, Cheshire Regt. and R.F.C.

Sec. Lieut. Victor White, South Staffordshire Regt., attd. R.F.C.

NAVAL.

The following appointments have been made in the Royal Naval Air Service:—

JUNE 5th.—Flt. Sub-Lt. (temp.) W. R. Dainty, granted temp. commn. as Lt. (R.N.V.R.), seny. June 4th, and apptd. to "President," addl., for R.N.A.S.

Temp. Comms. (R.N.V.R.) have been granted to the under-mentioned, seny. as stated.—Lt. A. C. Lovesy, and apptd. to "President," addl., for R.N.A.S., June 1st.

Mr. C. E. Turner has been entered as Lt. (temp., R.N.V.R.), seny. June 6th, and apptd. to "President," addl., for R.N.A.S.

JUNE 11th.—Mr. R. St. C. Talboys granted a temp. commission as Lt. (R.N.V.R.), seny. June 4th.

ADMIRALTY COMMUNIQUÉS.

JUNE 5th.—Naval aeroplanes carried out an attack on the night June 3rd-4th on the aerodrome at St. Denis Westram, near Ghent, and many bombs were dropped with good results.

The enemy seaplane base at Zeebrugge was attacked by our seaplanes at the same time, and the shipping in Bruges was also bombed.

All our machines returned safely.

JUNE 6th.—Yesterday afternoon (June 5th), at 5.30, four Royal Naval Air Service pilots on patrol off Dunkirk observed about 18 enemy aircraft off Ostend, well out to sea, proceeding in a north-westerly direction. Indecisive engagements took place, and the enemy were chased to England.

On their return journey the enemy were pursued and engaged by a naval machine from an air station on the Kentish coast. Two enemy aircraft were in turn attacked and driven down by this pilot, who then landed at Dunkirk.

Other engagements between Royal Naval Air Service machines from home stations and the enemy also took place over the Thames estuary.

Later, 10 naval pilots from Dunkirk encountered 15 hostile aircraft off Ostend returning from their raid on England, and numerous fights took place. Two of these hostile aircraft were completely destroyed, and four others driven down out of control, of which two are considered also to have been destroyed.

All our machines returned safely.

Photographic reconnaissance over Ostend shows that as the result of yesterday's bombardment from the sea the majority of the workshops in the dockyard were either seriously damaged or totally destroyed. The entrance gates to the dockyard basin, the wharf, the submarine shelter, and a destroyer under repair were badly damaged. It appears, also, that several vessels were sunk.

On June 4th a hostile machine was attacked by one of our Royal Naval Air Service pilots from Dunkirk 15 miles out at sea and driven down in a vertical nose-drive into the sea.

During the night of the 4th-5th June a successful bombing raid was carried out on the hostile shipping in the harbour of Bruges. A big explosion was observed and many smaller ones. This was

followed by another raid on the same objective at daybreak. In all many tons of bombs were dropped.

A hostile kite-balloon was shot down by one of our machines.

In every case all our machines returned safely.

[See Home Command and German communiqués.]

JUNE 7th.—An attack was carried out yesterday (June 6th) by a squadron of naval aeroplanes on the enemy aerodrome at Nieuw-munster (about 15 miles south-south-west of Blankenberghe). A number of bombs were dropped, one big shed being hit, and several bombs falling close to two machines in the aerodrome.

On the return journey the bombing machines were attacked by four hostile aircraft, which were driven off.

All our machines returned safely.

JUNE 9th.—A bomb raid on the St. Denis Westram (five miles south-west of Ghent) aerodrome was successfully carried out to-day by the Royal Naval Air Service.

All our pilots and machines returned safely.

JUNE 10th.—Vice-Admiral, Dover, reports that the latest reconnaissance of Ostend shows that all large shipping has been removed from that harbour. The two destroyers lately reported as being towed to Zeebrugge are probably those damaged during the bombardment, which have been removed from the basin. The harbour presents a deserted appearance.

JUNE 11th.—Vice-Admiral, Dover, reports that:—

At about 5 a.m. to-day one of H.M. drifters, "I.F.S.," Lt. H. E. Bell-Irving, R.N.V.R., in command, whilst on patrol duty encountered a group of five enemy seaplanes and engaged them.

One machine was destroyed, the pilot being rescued by another enemy machine.

This machine was in turn attacked by the drifter, and both pilots were taken prisoners, the machine being so badly damaged that it sank while being towed into harbour.

The remaining three enemy seaplanes made good their escape.

[Will someone be good enough to write a history of the Bell-Irving family? It seems impossible to open a newspaper or read a Gazette without finding that one of them has distinguished himself in some way or other, or has been promoted.—Ed.]

JUNE 11th.—In connection with the recent offensives on the Western front an expression of thanks has been received from the Army Council for the services rendered by the Naval Air Squadrons at present with the Expeditionary Force. The Army Council endorse Field-Marshal Sir Douglas Haig's appreciation, which he expressed as follows:—

The pilots have shown energy, gallantry, and initiative, and have proved themselves capable of standing hard work and hard fighting. Further, the machines with which they are provided have undoubtedly helped largely towards the success of the aerial fighting which has taken place this spring on the front of the British Armies in France.

THE CASUALTY LIST.

Reported June 6th.

KILLED.—Duncan, Flt. Sub-Lt. D. A., R.N.

ACCIDENTALLY KILLED.—Disette, Flt. Sub-Lt. A. C., R.N.

DIED OF WOUNDS.—Orchard, Flt. Sub-Lt. W. E., R.N.

DIED AS A PRISONER.—Trechmann, Flt. Sub-Lt. B. A., R.N.

SLIGHTLY WOUNDED.—Breese, Squad. Comdr. (Engr. Lt., R.N.)

C. D., R.N.

PREVIOUSLY MISSING, NOW UNOFFICIALLY REPORTED KILLED.—Wambolt, Flt. Sub-Lt. H. R., R.N.

White, Flt. Sub-Lt. J. P., R.N.

ROYAL NAVAL DIVISION.—PREVIOUSLY MISSING, NOW UNOFFICIALLY REPORTED PRISONER.—Owen, Sub-Lt. H. W., R.N.V.R., attd. R.F.C.

Reported June 8th.

MISSING.—McNeil, Flt. Sub-Lt. Percy G., R.N.

WOUNDED.—Cockey, Flt. Sub-Lt. L. H., R.N.

Pavitt, Engr. Lt. F. C., R.N.R.

ACCIDENTALLY INJURED.—Playford, Prob. Flt. Officer N. P., R.N.

PREVIOUSLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED KILLED.—Ingham, Flt. Sub-Lt. J. M., R.N.

Maxwell, Sub-Lt. J. E., R.N.V.R.

Reported June 9th.

KILLED.—Conby, Lt. H. B., R.N.R.

Gandy, Actg. Gnr. H. H., R.N.

Wallace, Flt. Sub-Lt. H. D. M., R.N.

ACCIDENTALLY KILLED.—Pitt, Prob. Flt. Officer, W. W., R.N.

SEVERELY WOUNDED.—Nalder, Flt. Sub-Lt. J. F., R.N.

Reported June 11th.

ACCIDENTALLY KILLED.—Ellingworth, C., Air Mech., 2nd Gde., F5384.

Gibson, H. N. J., Aircraftman, 2nd Gde., F14744.

Mitford, F. C., Air Mech., 2nd Gde., F4290.

Oldman, L., Aircraftman, 1st Gde., F24346.

Weavers, A., Air Mech., 1st Gde., F11001.

Woolhead, W. H., C.P.O., 3rd Gde., N4159.

CORRECTION.—PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN TURKEY.—Jones, W. E., Ldg. Mech., 217874.

(Continued on page 1548.)

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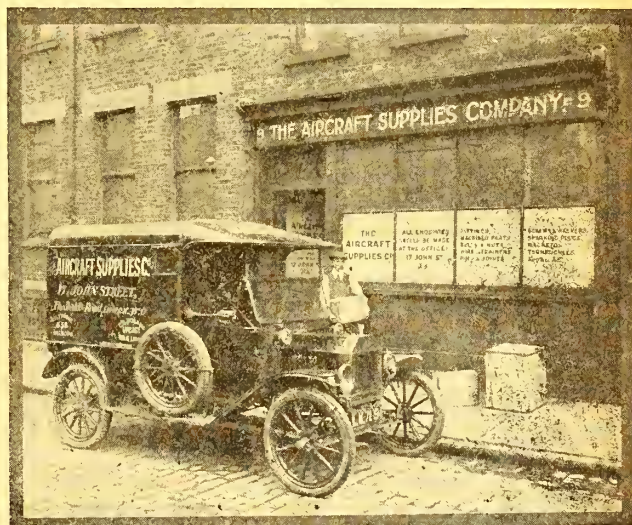
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The Production of Aeroplanes and their Components.

BY STEPNEY BLAKENEY.

FOREWORD.

[The following series of articles does not pretend to be a complete exposition of the production of any particular type of aeroplane. So many mechanical engineers of all ages have recently come into the Aircraft Industry, and so many young men, draughtsmen and so forth, hope some day to occupy responsible positions in the industry in the future, that there has for some time been an evident need for a dissertation on general lines on the methods by which aeroplanes are produced, so that those whose work confines them to one section of production may obtain some idea how the work is done in other sections.

It is assumed that the reader wishes to produce an ordinary type of aeroplane in a smallish factory, and the articles are written from that point of view, as being likely to convey an all-round idea of the problem in a reasonable space.—C. G. G.]

In introducing the subject of the production of aeroplanes and their components it is necessary for those who have no experience in the Aircraft Industry that they should be given a slight insight into the works' organisation required, to enable them to grasp the fundamental principles and realise what position their abilities will permit them to hold. One can only be a general manager in name, if one cannot manage, and this remark applies to all concerned holding lower grade positions.

Let it be assumed that a small but progressive and enterprising engineering firm are about to take up aircraft work. If the head of the firm is a practical man, who has given the subject of aircraft production considerable thought, which is very necessary, before entering into this industry, he will have had to consider many difficult points in connection with this class of work.

POINTS TO BE STUDIED.

The principal points to be studied may be summarised as follows:—(a) The suitability of his works: premises. (b) The suitability of existing machinery. (c) The purchase of additional new plant and tools. (d) The estimating for new contracts. (e) The placing of orders for raw materials. (f) The date for its delivery in and out. (g) The capabilities of his existing staff. (h) Their selection for various duties. (i) Whether it will be necessary to introduce a few experienced men to act as instructors. (j) The proportion of metal to wood workers necessary. (k) The utilisation of female labour, and accommodation for women workers. (l) The storage of timber and steel. (m) The arrangement of raw material stores. (n) The planning, progress, and inspection departments. (o) The finished parts stores. (p) The packing of finished parts, and methods of delivery.

Having enumerated the principal points, it will be well worth while to consider some of them in detail.

The works will now have, to a large extent, to be cleared of all previously used material, and possibly rearranged, and I would suggest that the simple process of window-cleaning be vigorously carried out, as it will probably cause many a scrap heap to come to light, and will enable the new work to be started under good conditions.

The workshops that are to be used for aircraft work should now be selected, according to their adaptability for the work that is to be done in them.

THE ERECTING OR ASSEMBLING SHOP.

Naturally, the largest shop will be utilised for an erecting shop, that is to say, if the entrance is conveniently situated and

arranged for large cases of goods being brought in or taken out for loading into lorries.

Headroom is also an important item if machines are likely at any time to be erected here, 16 ft. being a convenient height. It is also frequently useful if a steel joist runway is fitted up in a portion of this shop as it enables engines to be easily handled and put into machines, and it is also useful as a means of attachment for weighing machines.

THE FITTING SHOP.

The fitting shop is the next shop that ought to be considered, for it is one of the first shops that should be equipped and started, as metal work takes a surprisingly long time to produce. Of course, many people will tell you it can be made very quickly and easily, but I have generally found that the first consignment of the "quickly and easily made" variety usually finds its way to the scrap heap quickly and easily.

Light and the arrangement of the benches should be carefully considered, as it is here that the largest amount of supervision is required, especially if the hands are new at the work. The equipment should consist of 4½-in. vices mounted on strong benches, about 4 ft. 6 in. apart, with one cast iron chipping block, 10 in. by 10 in. by 2 in. thick, to each three vices. In addition there should be a metal jigsaw, with at least half a dozen 10-ft. coils of ½-in. wide metal jigsaw blades; a quick-work shearing machine with rotating cutters—power driven preferably; a 36-in. guillotine to cut up to 8 gauge steel sheet—power driven; a set of rolls for sheet metal work; one 7-in. bladed hand shearing machine; one sensitive drilling machine to take ½-in. twist drills; and an annealing furnace of moderate size, with a pyrometer, gas-fired preferably; also an acetylene welding plant for one or two operators.

This plant should be sufficient outfit for 10 to 20 workers where rapid production is essential.

THE METAL MACHINE SHOP.

The metal machine shop should next be considered. This should be equipped with 6½-in. centre precision lathes with self-centring and independent chucks; ¾-in. and 7-in. Capstan lathes, and one 1½-in. Capstan lathe, all preferably with lever feed, and six adjustable stops; a couple of good plain milling machines; a vertical milling machine, and a dividing head; a tapping machine; an emery grinder and disc grinder; a universal cutter grinder; a couple of sensitive drills; and a good plain drilling machine to take up to ¾-in. drills. Also a 13-in. shaper is essential. A 10 or 20 ton power press is useful, as also is a heavy fly press.

The whole will be driven by the most convenient power available, and, where possible, will be placed on solid foundations, this being a matter of considerable importance for aircraft work.

SAWMILL OR WOOD MACHINE SHOP.

The sawmill should next be equipped. For breaking up large timber, a 36-in. saw is useful. There will also be an 18-in. circular saw; an overhand planing machine; a thicknessing machine; a couple of vertical spindles with a speed not under 5,000 revs. per minute; a bandsaw; a jigsaw; a grinding machine for plane irons; a brazing apparatus for bandsaws; a disc sand-papering machine; and a horizontal sand-papering machine. A four-cutter is, of course, very useful also.

This plant will be driven preferably with 20 per cent. excess of the power required.

The placing of the machines in the sawmill should receive

careful attention, and it is advantageous to lay out the machines on paper before they are fixed, as the long lengths of timber worked may cause considerable inconvenience when all the machines are working at once, and a considerable fall off in output will occur.

THE WOOD-WORKING SHOP.

The wood-working shop does not require much beyond the ordinary joiners' benches, except a few spar and longeron benches, which should be about 20 ft. long by 2 ft. wide to enable two joiners to work on them on each side. There should also be a drilling machine; a good grindstone for the wood-workers' tools; a steam box for wood bends; a gas-heater for glue pots; a large setting out table, 12 ft. by 6 ft., and glueing cramps on benches for hollow spar work.

THE DOPE SHOP AND COVERING SHOP.

The dope shop is a shop which requires special attention on account of the fumes which have to be removed. Reference should be made to the Home Office regulations. Also, heat is an important matter, and the heating apparatus must have ample proportions if delay in doping is not to occur.

The covering shop does not call for any special consideration beyond size, dryness and cleanliness, and close proximity to the dope shop.

THE RAW METAL STORE.

The raw metal stores should be of ample proportions, with at least a 30 per cent. margin for expansion. To commence with, 300 Sankey bins, 14 in. by 14 in. by 14 in., are useful. These should, for preference, be built up as portable sections, double-sided, about 6 ft. by 6 ft. by 2 ft. 5 in.

Tubes and steel rods and bars can best be stored in a vertical position, where head room permits, with short vertical racks for short lengths.

Sheet steel should stand in vertical racks, arranged according to the gauge.

THE TIMBER STORE.

The timber store should next have attention. The site should be as close to the point of delivery as possible, and this again should be conveniently adjacent to the sawmill, otherwise valuable time and money will be lost in handling the large timber.

To save unsuitable timber from being cut up for component parts, it is best for someone who has had experience with the selection and conversion of timber into aircraft parts to examine the timber and superintend the stacking of all timber with suitable grain and quality in piles, according to its suitability of grain for the various parts required in aircraft work. A notice should be nailed on a board, attached to each pile, specifically stating for what purpose each pile of timber is most suitable. This simple organisation will probably save the firm pounds, and also possibly their reputation.

The timber shed should be dry and airy, and all timber should be at least 9 ins. off the ground, laid flat, and with frequent distance pieces of packing between each plank to admit of a free circulation of air between.

ENSURING ACCURACY.

The fine limits of dimensions in aircraft work necessitate the machinery being in an accurate working condition, and a thorough examination of it is necessary. Inaccurate machines must be made accurate or scrapped, those not suitable being replaced by machines that are. This will involve promptly selecting and ordering the new machinery required. The firm will also require micrometers; a couple of steel tapes; wire gauges; protractors; and flexible steel rules, preferably marked in decimals and millimeters.

ORDERING MATERIAL.

The special steel required, both sheet and bar, nuts, bolts, etc., must be now ordered and obtained. These must be strictly in accordance with the specification mentioned, and should be ordered by the planning department after a careful examination of each plan of component parts, and the list checked.

The timber required should also be ordered, and a selection by a competent specialist made before delivery.

SELECTION OF STAFF.

The selection of the staff for the various departments and posts therein will require careful consideration. The first men to be selected should be for the planning or organising department.

These men should be trained draughtsmen, who preferably have had workshop training, as they must be capable of reading a drawing and producing one, together with dimensioned sketches of parts required, and drawings of the necessary jigs. These men can, with advantage, be divided into four groups, namely, those experienced in metal working, those experienced in wood work, and those experienced in tool and jig work.

One or two others with a fair general knowledge will be allocated to the duty of recording the works' production orders issued to the works; the drawings accompanying them, and the date on which these are issued; ascertaining the date on which production should commence; and reporting each day

to the manager those items on which production is not in accordance with the schedule of parts required.

This system, if carefully organised and rigidly carried out, will be found to be of the greatest possible value to all concerned in production, and will prevent delay in the erecting and other shops. Thus, it may be looked upon as a valuable step towards rapid production, as those items which are behind time will at once have the attention of the manager and the foremen. These officials will scrutinise the cause of delay, and the method of production, and, if necessary, will change it at the earliest moment or remedy the material which may be faulty, or alter the jigs, and thus prevent "scrap" being made.

FITTING SHOP PERSONNEL.

The foreman of the fitting shop should next be selected. He should be chosen for his superior knowledge of metal working, his appreciation of accuracy in detail, and, if possible, his ability for reading drawings correctly, together with his faculty for leading his men, and controlling their methods. Under his control should be placed a first-class marker-off, whose duty will be to mark off accurately all templates on black iron sheet, or other available metal. With this man, a first-class template maker should be set to work, whose duty it will be to produce truly and accurately all templates for sheet metal parts that have to be made.

These, when completed, should be carefully checked by the inspection department and stamped. They will then be ready for the use of semi-skilled hands, who will roughly cut out and finish off the sheet metal parts, which will then be passed on to the skilled metal workers to complete.

ARRANGEMENT OF HANDS.

The skilled metal workers should next be selected. These men, being trusted workers, may, with advantage to the foreman, be placed in the part of the shop which is most difficult for him to supervise. Near them should be placed the bench for the best of the unskilled workers, and close to the foreman's office, or in the part of the shop most accessible for supervision, should be placed those workers who have the least experience. This system has been tried and has given excellent results, and can be recommended for a trial.

Female labour should preferably work in a separate part of the shop, there being many jobs, such as bending wiring plates, stamping the drawing number and part numbers, cleaning off scale after annealing, cleaning up castings, rough filing small light-gauge parts to a plus size template, which can be undertaken by them with success.

EXPERIENCED HANDS.

With regard to the introduction of men experienced in aircraft work, this is, of course, a matter best left to the judgment of the management, but, if the management themselves have had no practical experience of aircraft work, then experienced men as instructors or inspectors must be introduced. It is not then in the interest of the management to interfere with them or criticise their methods, excepting when they fail to produce finished work.

If you do honestly see ridiculous systems or methods employed by these men, then you can say to yourself that you have also failed; that is, by selecting the wrong men. These remarks can well receive the consideration of the management of some few works, and be taken to heart by them. In other words, "Don't interfere with things you know nothing about. Leave them to the specialist."

Have you not scoured the advertisements in THE AEROPLANE for weeks to find this "specialist," has he not undergone an inquisitorial examination before your board of directors, and has he not been told that his services will be accepted on account of his previous experience, and on condition that if he fails, penalties almost equal to those of the Spanish Inquisition will be inflicted on him?

PROPORTION OF WORKERS.

The proportion of metal and wood workers to erectors and coverers is one that requires thought and judgment and a keen grasp of the rate of production, for money and temper will inevitably be lost if this important matter is not properly dealt with. Remember that wood work is produced at double the rate of metal parts for the same number of hands.

THE INSPECTION DEPARTMENT.

The firm's own inspection department is a department that should be organised at once, as it may be regarded as a safety belt for the firm, to prevent it from dropping into the sea of disapproval of the A.I.D.

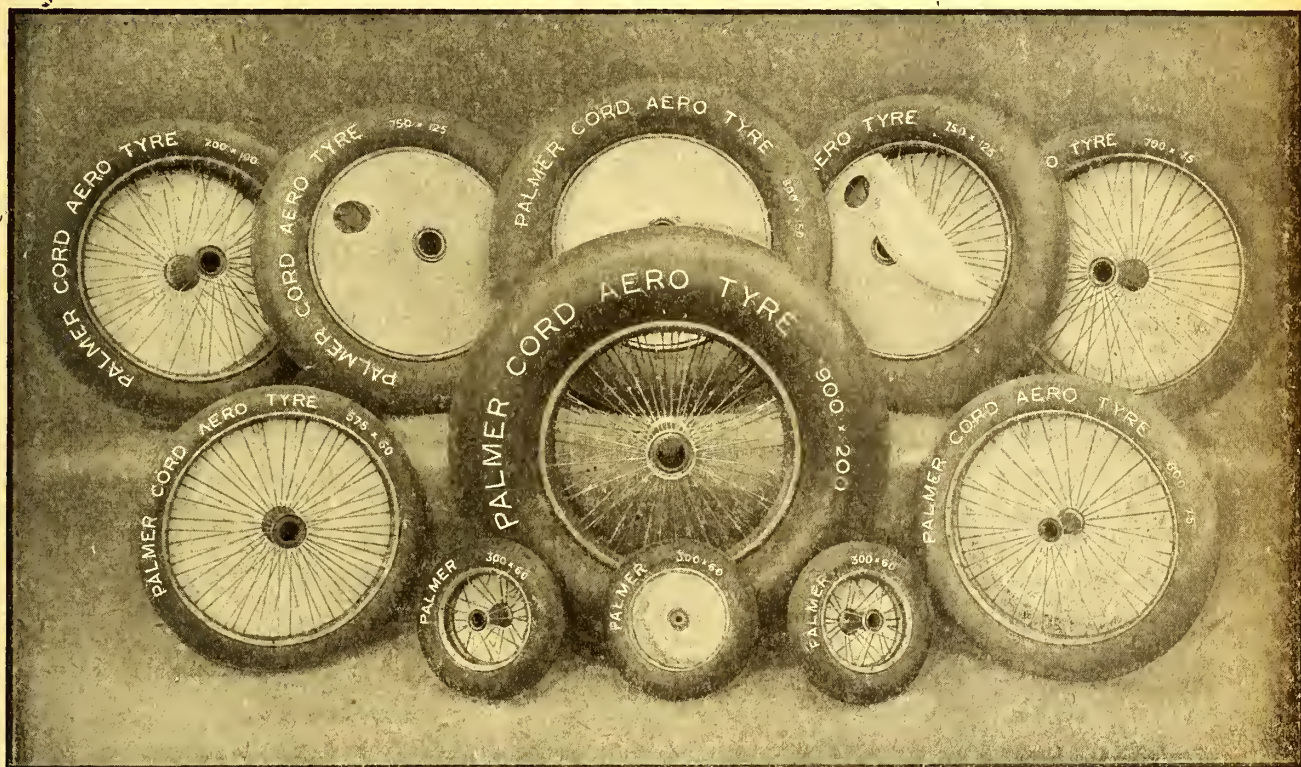
A well-lighted quiet room, with a well-finished bench and lock-up drawers, a vice and a few stools, are required, with a nest of bins and drawers capable of holding copies of all the drawings which are issued to the works. These should be filed in batches, each batch constituting all the drawings of a complete component part, such as a rudder, or a fin. A separate drawer or drawers should be kept for each contract. Don't mix them all up, it wastes too much time.



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"	17	72.39	12.7	Central	"	*80	178.	44.45	132/46	"	33	150.	38.09	Central
450 x 60	30	89.	31.75	Central	"	*91	178.	31.75	132/46	"	66	178.	38.89	132/46
575 x 60	14	150.	38.09	104/46	"	*98	178.	44.45	Central	"	96	178.	55.	132/46
"	21	160.	28.	Central	700 x 100	2	185.	55.	135/50	800 x 150	8	185.	55.	135/50
"	34	150.	31.75	104/46	"	4	185.	55.	Central	"	10	185.	55.	Central
650 x 65	9	178.	44.45	132/46	"	18	178.	44.45	132/46	"	36	185.	55.	135/50
"	20	178.	38.09	132/46	"	26	150.	40.	Central	"	40	185.	60.32	135/50
"	75	178.	31.75	132/46	"	33	150.	38.09	Central	"	42	185.	60.32	125/60
600 x 75	14	150.	38.09	104/46	"	66	178.	38.89	132/46	900 x 200	47	185.	55.	125/60
"	21	160.	28.	Central	"	96	178.	55.	132/46	"	97	250.	65.4.	Central
"	34	150.	31.75	104/46	750 x 125	2	185.	55.	135/50	1100 x 200	52	185.	55.	116/69
700 x 75	9	178.	44.45	132/46	"	4	185.	55.	Central	"	57	185.	55.	Central
"	20	178.	38.09	132/46	"	18	178.	44.45	132/46					

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The inspectors should be chosen because they know their trade. We will take first the inspector of wood parts. He must be a skilled wood-worker, used to high-class accurate finish. If you can get him, have one who has been used to pianoforte manufacture. Next ascertain if he is a keen judge of timber and knows what constitutes sap and decay, or dead wood, and find out what he would do with a pocket of resin. Would he pass it, or not?

He must also be well used to, or capable of, measuring up parts with dead accuracy, hundredths of an inch count, and so does shrinkage of newly worked timber. A $1/32$ in. full is better than $1/100$ in. under size. Also, it may save your firm money if he remembers that ash is a hard wood, but it shrinks. I once was told that it did not, but I don't believe so now. Also, a short cross-grain will not do for spars, inter-plane struts, and longerons.

Ask him how he would test a finished wing spar without damaging it? There is one very simple way that works all right; take it up with both hands, hold it level with your chest, and shake it vigorously.

He should also have a knowledge of the various makes of glues, and how to prepare them for use. Certain glues now in use in aircraft work require careful treatment and must not be over-heated. If they are, they will be spoilt, and bad joints will result.

The inspector of metal work may now be considered. He must be an all-round first-class mechanic, and preferably have had experience in both machining and fitting. He should also be thoroughly accustomed to the use of a micrometer, gauging, accurate setting up and marking off, and he should appreciate what it is to have to work to a five-thousandth of an inch.

THE INSPECTORS' POSITION AND EQUIPMENT.

The importance of the posts held by the firm's inspectors should be recognised by the firm for whose reputation and interests they are working, and the inspectors' reports should receive the careful consideration and attention from the general manager and works manager that they deserve. Also the inspectors themselves should realise and appreciate the position they hold, and act accordingly.

The firm should supply the inspectors with a reasonable kit of tools to enable them to measure accurately the component parts, and experience has shown that the following may be considered a useful selection. For our purpose, we will take up either a Brown and Sharpe or Starretts' catalogue of small tools. In this case a Brown and Sharpe small tool catalogue, No. 25A, is to hand. From this, the following tools may, with advantage, be ordered:—Micrometer calliper No. 2, English measurement, $0\text{--}\frac{1}{2}$ in., with ratchet stop, for strainer work; micrometer calliper, No. 10, English measurements, $0\text{--}1$ in., with ratchet stop; micrometer calliper, No. 30, English measurement, $0\text{--}2$ in., with ratchet stop; micrometer calliper, No. 235, rolling mill gauge, English measurement, $0\text{--}0.400$ in., with ratchet stop; inside micrometer calliper, No. 250, $0.200\text{--}1$ in. English measurement; inside micrometer calliper, No. 252, $\frac{1}{2}$ in.— $1\frac{1}{2}$ in. English measurement; B. and S. combination square, without centre head, No. 401, size 6 in.; B. and S. protractor, with reversible protractor head, size 18 in., English measurement; improved bevel protractor, No.

AIRCRAFT AND COACH-BUILDING.

There is but little doubt that with the advent of commercial aviation in all its different departments, of mail carrying, heavy and light goods transport, and last but not least, the work of human transit, both for purposes of business and pleasure, the coach-builder will ply his specialised trade to an important extent.

It is quite certain that the peace-time aeroplanes, both of the dividend-earning and spending varieties, will receive far greater finish in respect of their appointments than has been deemed necessary for the aeroplane of war.

In the meantime the coach-building industry is well represented in the aircraft industry by several of its most important members, who have departed somewhat from their routine work to assist the output of war aeroplanes. Their work has always been of high quality, and the degree of finish to which their workmen have become accustomed is of benefit to the new work.

An old-established firm of coach-builders which has acquitted itself well in this respect is the house of W. Cole and Son, of Hammersmith, and of High Street, Kensington. This firm dates back to early Victorian days, and possesses among its treasures a small donkey chaise built for the late Queen Victoria by the firm's predecessors.

The works have been well adapted for the new sphere of activity under the superintendency of Mr. Mackay, the works' manager, and the buildings have lent themselves readily to the transformation. The upper shops are exceptionally light and airy and well suited to the employment of female labour.

Of the work in hand, it is not possible to say more than that it is of the best, both in wood and metal, and some exceptionally interesting labour-saving devices are employed.—W. L. W.

493, 12 in. blade; vernier calliper, No. 570, English measurement, size 6 in.

THE INSPECTOR'S DUTIES.

The general duties of the Inspection Department are to inspect and pass all raw material; to see that none but passed materials are issued to the works; to look for and investigate and report on all unsatisfactory material, and stop further use at any stage of its conversion into finished parts; to inspect all parts when finished, before they are passed to the A.I.D. for inspection; to watch the assembly of all such component parts as fins, rudders, tail planes, elevators, and fuselages, and see that no parts are used that are not passed by the A.I.D.; and to see that all rejected parts made by outside firms are returned to stores with a label attached, stating the name of the maker and the precise cause for rejection, so that the firm concerned may know the cause for rejection, so that the firm connected may know the day to the works manager:—

- (1) Lists of parts rejected due to faulty workmanship, and being under size, with name of workman and department.
- (2) Parts rejected due to faulty material, with maker's name.
- (3) Parts rejected due to drawing alterations and modifications.
- (4) Lists of parts or material required to be replaced, owing to being scrapped.

PLANNING DUTIES.

The duties of the Planning Department may next be considered. It may be briefly said that it is their job to ascertain the best way to do a job and to detail the operations. For this purpose an instruction-sheet may be issued to the works, with each order and drawing, and it should not be left for the workman to find out. Thus, work does not go to the fitting shop first, when it should go to the machine shop.

They will also keep records of material in store, and order all special material that is required and specified when looking through the drawings. They will also issue the drawings in the rotation in which the parts will be required in the erecting shops. This will save the erecting shop from getting the last thing first and the first thing last.

THE PROGRESS DEPARTMENT.

The Progress Department will receive these orders and see that the parts are produced in proper rotation in quantities as required. They will keep track of all orders in the shop; record daily progress, and report each day to the Works Manager any parts that are getting behind.

Orders for work requiring special precedence over other work will be dealt with on special orders, which have some identifying mark or colour, to distinguish them from the ordinary work.

FINISHED PARTS.

The Finished Part Stores should be separate from all other stores, and should preferably be near the Inspection Department. From here all parts required by the erectors should be issued, and from no other stores. This is essential, as it prevents parts which have not been passed by the A.I.D. being issued to the erectors, which is of the greatest importance.

(To be continued.)

GOOD ADVICE.

The following notice in the form of a poster has been issued to all users of Cellon:—

SPECIAL NOTICE.

To all employed in this department.

AVOID WASTING DOPE.

EVERY EFFORT MUST BE MADE to avoid waste of Dope and Dope Coverings. Waste can be avoided if the following points are watched carefully:—

1. Always keep all drums screwed up.
2. Never leave materials in the small containers when not in use, and so allow the solvents to evaporate.
3. Do not completely fill a container when the job in hand only requires half that quantity.
4. Do not fill the brush when there is only a small portion of fabric to cover, or when doping near the edge of a plane. Drippings on the floor are a serious source of wastage.
5. Dope is a thick liquid, so care must be taken to completely empty drums before returning them to us. Drums should always be turned upside down and allowed to drain.
6. Keep your brushes clean.
7. Check carefully the weight of deposit on fabric so as to get the increase called for in the Doping Schemes.

SEVERAL OF THE INGREDIENTS USED IN THE MANUFACTURE OF DOPE ARE ALSO NEEDED FOR OTHER WAR MATERIALS. THEREFORE, WASTAGE IS UNPatriotic.

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TITANINE



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Telegrams . TETRAFREE, PICCV, LONDON.

CHW.

REPORT OF THE U.S. NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

The second report of the National Advisory Committee for Aeronautics of the United States has been published. It comprises five technical papers and an introduction, making up a volume of 650 pages. The introduction includes an explanation of the methods by which the committee does its work, and a brief résumé of the problems now under investigation. These latter cover a wide range, including laboratory tests of various sorts, the further mathematical investigation of stability, researches on metals, the preparation of an up-to-date aeronautical bibliography to supplement Brockett's work in this field, etc. A financial report for the past year, and an estimate of the needs of the committee in carrying out its plans for the future, are also included.

The first two of the five technical reports deal with aeronautical instruments. The third, presented by Professors H. Diederichs and G. B. Upton, of Cornell University, is devoted to mufflers for aeroplane engines, and gives a summary of what has been so far accomplished along these lines, in addition to the results of some experiments performed at Cornell.

The fourth report, and by far the most important of all, is by Professor Charles E. Lucke, of Columbia University, assisted by Professor F. O. Willhoff, and deals with the design of gasoline carburetors. It occupies more than 500 pages. The first part of the report gives a general review of the problem to be solved. The second is made up of a complete list and classification of all United States patents, according to a new system, and by drawings and specifications pointing out the salient features of some hundreds of devices from among the several thousands examined.

Part five is devoted to the theory of carburation, and includes theoretical and empirical formulæ for the flow of fluids.

Part six gives the results of a large number of tests on standard American carburetors, and is illustrated by a large number of curves. The report closes with a discussion of the literature on the subject and a brief tabulation of conclusions and recommendations for future researches.

The last report is a translation of a paper by L. Marchis, Professor at the University of Paris, on "Experimental Researches

on the Resistance of Air." The various types of aeronautical laboratories are discussed, and those at present in operation in France are described. There is a thorough treatment of graphical methods, including analyses of the so-called logarithmic charts used by M. Eiffel and others, and of the notations whereby the results of model tests of all sorts can be applied to full-scale practise. This is followed by an inquiry into the extent to which such applications are permissible. There are also summaries of a great number of tests on flat plates, wings and propellers.

THE DUESENBERG MOTOR.

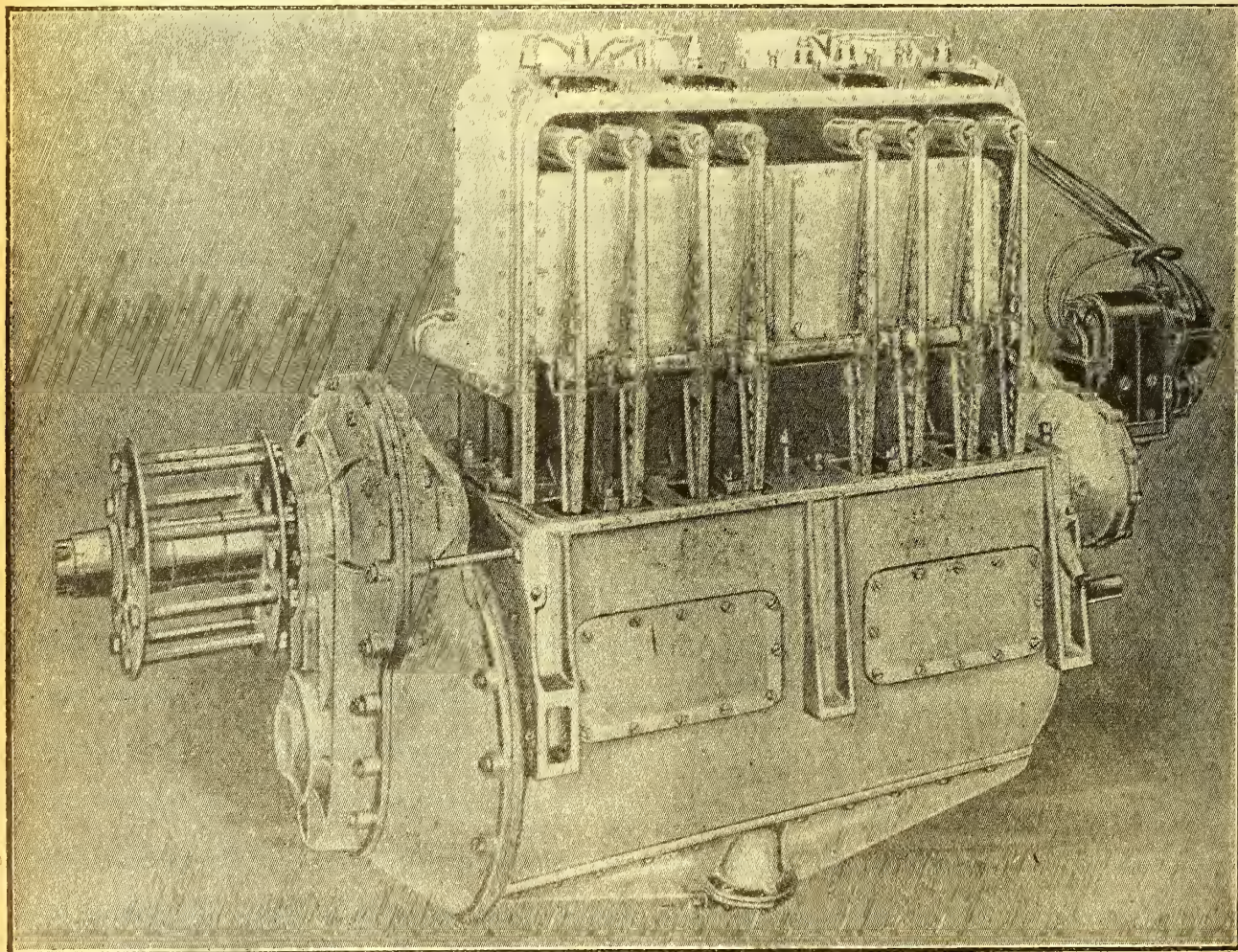
The Duesenberg Motors Corporation, which has produced highly successful automobile and motor boat engines, is now making at its new plant at Edgewater, N. J., aeroplane engines, and is in a position to fill orders.

The photograph shows the four-cylinder engine, brief specifications of which are: bore $4\frac{1}{2}$ ins., stroke 7 ins., weight, with magneto, carburettor, gear reduction and propeller hub, 509 lbs.; without gear reduction, 436 lbs. The manufacturer states that the engine develops 125 h.p. at 2,100 r.p.m. (propeller speed 1,210 r.p.m.)

There are two inlet and two exhaust-valves for each cylinder. The cylinders are semi-steel, with aluminium plates enclosing water jackets. Pistons are Magnalite aluminium compound and specially ribbed. Valves are tungsten steel, 1 15-16 in. inlet and 2 in. exhausts. The valve stems are lubricated by splash in the valve action covers. Connecting rods are tubular, chrome nickel steel. The crankshaft is one piece forging, hollow bored, $2\frac{1}{2}$ ins. in diameter at main bearings. The crankcase is of aluminium, barrel type.

The engine is lubricated by an oil pump in the base, supplemented by a splash system. An oil pressure of approximately 25 lbs. is maintained, thus insuring thorough lubrication. The troughs under the connecting rods are constructed so that each rod will dip up a supply of oil, regardless of the angle of flight.

The engine can be operated with or without the reduction gear. Two of these engines can be installed side by side in a comparatively small space, which is an advantage in some cases.



The Duesenberg Motor, which has horizontal valves operated by rocker-arms.

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Costing in the "One Man" Factory.

BY GEORGE H. MANSFIELD.

During the last three years, I have visited many contractors engaged in the manufacture of aeroplanes and component parts. I have visited the large works and also the small "one man" shop, where the owner is generally manager, timekeeper, etc., and cost clerk combined. It is the latter in reference to which I write these notes. I have found that in the majority of cases no definite system of costing was followed, but "rule of thumb" methods, which may lead either to success or bankruptcy.

One owner-manager made a small clip which he sold for sixpence; while others sold the same thing at prices ranging from 1s. to 1s. 9d. We went into his profits and net cost together, and found the latter to be sixpence. He was, therefore, manufacturing at a loss, and this was the fitting which kept the majority of his men employed.

A few points overlooked in this case were:—

- (1) No allowance for rent, the works were freehold.
- (2) No allowance for depreciation of machines.
- (3) No allowance for money invested previously on improvements.

I would strongly advise Mr. Subcontractor to introduce a bonus or piece-rate system as soon as possible. I recommend the premium bonus system. In this a definite time is granted in which to complete a certain job, say, 20 hours. If the workman does this in 10 hours, then he takes half the time saved as bonus, and his employer takes the other half. The workman, therefore, is paid 15 hours for 10 hours' actual work. The system will be quite familiar to most of my readers.

By introducing some such method, the employer will collect a large fund of information re labour costs, which will prove an invaluable aid in future estimating.

THE BENEFIT OF COMPETITION.

I paid a visit to one small shop where the owner could not keep his boy labour, and suggested a piece-rate; to this the boys were averse. We took one job, on which a rather clever youth was working, and the manager stated that he was doing this work in 60 hours, and it was showing a profit. As an experiment, the job was given out on premium bonus at the same rate, i.e., 60 hours.

The next time I met my friend I found that the experiment had proved far more successful than we had expected. The job was now finished satisfactorily in 20 hours; result, increased production and profits.

My friend suggested that the time should be cut, that, obviously, the boy had not previously been doing his duty, etc. I disagreed with his suggestion. Was he not making more profit with increased production? Were his rivals underselling him? Had his business in this line dropped off since the boy completed the job in 20 hours. The answer was in the negative to all my queries. I therefore insisted on my original contention that the rate should not be cut.

For future guidance the following rules were formulated:—

No rate in this establishment will be reduced for at least six months unless:—

- (1) Other firms can be proved to be selling under our prices.
- (2) The part is made from different material.
- (3) Jigs and press-tools or special tools or methods are introduced.

EXPECTED OPPOSITION.

I am aware that my proposition, as set out above, will meet with a storm of opposition from manufacturers. I shall be most happy to receive criticism, friendly or otherwise.

Let us analyse our present example. We will suppose that the article mentioned above originally produced in 60 hours sold for 60s.

Workman's time 60 hours at 4d. per hour	= 20/0
Material	= 3/0
Establishment, etc., charges at 5d. per hour. 60 hours	= 25/0
Profit	= 12/0

What do we get as a result of the job being finished in 20 hours?

Workman's time 20 hours, and 20 hours bonus. 40 hours at 4d.	= 13/4
Material	= 3/0
Establishment, etc., charges, 20 hours at 5d.	= 8/4
Profit	= 35/4

I do not say that these figures are the actual ones on the above job, but the example set will prove that you make a very handsome extra profit on each, of almost 200 per cent., and your production increases from 1 to 3 in the 60 hours.

If you can still sell at 60s. you have no occasion to cut your piece-rate, as you now get three profits of 35s. 4d. instead of one at 12s.

A WAGE QUESTION.

This leads me to another point: if you have a smart youth who

is as good a workman as one of your men, do not reckon his rate at what you actually pay him when making up your costs. If Tom, Dick, or Harry do the work in 40 hours at 1s. per hour, and the aforesaid youth does it satisfactorily in 40 hours at 4d. per hour, then in costing his rate must be taken at 1s. per hour. —[Also you might raise his wages.—Ed.]

If you find a pearl these days, you need not make a present of his work to others; this is not business.

DEPRECIATION.

I found that Mr. Subcontractor does not pay sufficient attention to his depreciation charges. In War time this is very important, but I have met contractors who say that as they are making extra good profits, if a machine wears out they can easily afford to replace it, and the old machine will surely have paid for itself. Very good; your old machine is paid for, you have the money as profits, but you spend it on the new machine.

At the present time machines have a very inflated value, due to scarcity, after the War the prices may slump. Of course it may not, but can we afford to "wait and see"? Emphatically, no.

A good percentage to allow for depreciation is 15 per cent. It depends on the kind of work done. If doing work which is highly competitive, then 10 per cent. is the most you can allow.

You have a lathe you value at £80, to this you fix a turret and special tools, costing you £20; then, in future, your charge on this machine for depreciation is 15 per cent. on £100.

The £20 is also booked in as extensions to equipment, and on this amount you pay yourself 6 per cent. interest as establishment charges.

Do not lose sight of trifles like these, it makes all the difference to your small balance-sheet at the end of the year.

OVERHEAD CHARGES.

Another example. A small garage, bought originally for £300, had been much improved, and extensions added, costing in all £120.

How does the owner book this up on his establishment charges? The premises are freehold.

First of all he must deduct rent. But he pays no rent? No; but the rent asked for similar buildings in the neighbourhood may be debited, or, should rents be fairly high, a certain percentage may be taken, say, 6 per cent., as if he had invested the £420 in bonds. The latter way would give him a certain advantage over competitors in the neighbourhood who are not freeholders, at the same time covering his invested capital. Of course, the usual charges, such as 10 per cent. for depreciation of buildings, rates, taxes, etc., must also be made.

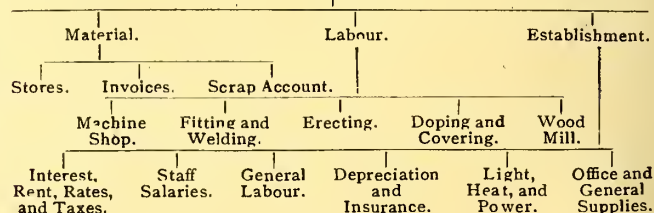
As property may increase in value in the near future, an extra percentage may with advantage be taken.

I attach a small diagram giving the principal costs of aeroplane manufacture, which, I hope, may be of some service to the small contractor. I do not claim this to be exhaustive. In larger shops these items may be again sub-divided, and, as a matter of fact, this will be necessary.

In small shops I advise the office supplies to be lumped in with staff salaries and general supplies, and if found workable, general labour wages may be added, according to amount of the latter.

Painting, varnishing, and enamelling are not included in above, as in small shops I advise an average to be taken of their cost for one month, and the rate then reckoned for one hour. In estimating jobs which require painting, etc., this rate is then taken into consideration.

TOTAL NETT COST.



A CORRECTION.

Mr. C. F. Dendy Marshall writes to point out that in the report of the discussion on Mr. Coatalen's lecture to the Aeronautical Society, the remarks made by him were ascribed to Mr. Hill. As Mr. Marshall originated the formula then noted, it will be well for those concerned with the history of aeronautics to make the correction. One regrets that the mistake should have occurred, and can only explain it on the assumption that some error was made in announcing the name of the speaker.

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THE PATENTS INDEX.

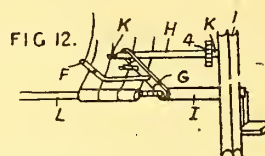
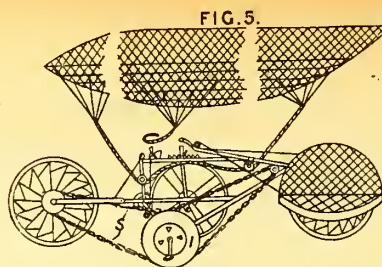
The subjoined list of recent inventions has been specially compiled by THE AEROPLANE from the current Official Patents Records.

PATENT APPLICATIONS.

Armitage, C. Flying machines. No. 7917. June 2nd.
 Astley, H. R. Propellers. No. 7949. June 2nd.
 Havilland, G. de. Aeroplanes. No. 7952. June 2nd.
 Macfie, R. F. Aeroplanes. No. 7650. May 29th.
 Pettingill, W. C. M. Aircraft. No. 7704. May 30th.
 Pile, T. A. J. Aeroplane. No. 7693. May 29th.
 Pratt, F. Imparting instruction in aerial observation. No. 7729. May 30th.
 Rowley, H. E. G. Aircraft and aircraft engines. No. 7865. June 1st.
 Sopwith Aviation Co., and anr. Aeroplanes. No. 7677. May 29th.
 Sopwith Aviation Co. and anr. Aeroplanes. No. 7678. May 29th.
 Vedrines, J., and anr. Landing skids of aeroplanes. No. 7698. May 29th.

105,249. Aeronautics. LAPORTE, L. L., 69, Boulevard Sebastopol, Paris.

PROPELLING; AERIAL MACHINES WITHOUT AEROSTATS.—In a supporting and propelling device having blades 5, 6 feathered about axes radial to the motor shaft 1, the trunnions 18, 19 of the blades rotate in radial sleeves 17 of a tubular hub having a spherical cam 22 secured to a shaft 15, and stops 20, 21 supported by the trunnions co-operate with the cam, either independently, as shown, or jointly. The movements of the blades may be controlled at will by causing the cam that drives the blades to be governed by a gear by means of which its position may be altered during rotation of the shaft 1. The operating-engine 11 is mounted in a pivoted frame 12, which, by means of a worm gear 13 or other control, enables the shaft 1 to be



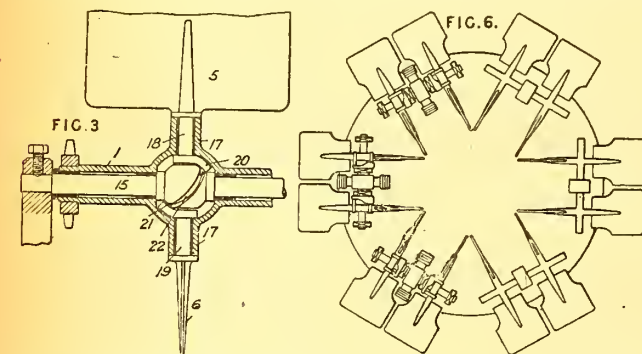
its side. The wheels are adapted to have their upper and lower portions enclosed at will by pairs of shallow hoods, of cork and wire mesh, as shown applied to the front wheel, those for enclosing the upper portion being fixed at right-angles to those for enclosing the lower portion, so that the pair not in use forms a laterally projecting plane on each side of the wheel. Both wheels are driven from a pulley 1 by belts comprising wire-bound ovoid cork links eye-letted and threaded on

cords. Springs S in the rear chain permit movement of the rear wheel. The pulley 1 is driven forwards or backwards by pedals through the reversing gear shown in Fig. 12. For forward driving, the pulley 1 is in engagement with projections on a sun-pinion carried by a sleeve I on a squared portion of the pedal shaft L. The sleeve I and a sleeve H sliding on a fixed spindle K are engaged by the forked ends of a lever G adapted to be moved by a lever F. When the lever F is operated, the sun-pinion is released from the pulley 1 and engages a pinion 4 on the sleeve H, the pinion 4 also engaging internal teeth within the rim of the pulley 1. A light motor may be used as an auxiliary in large machines.

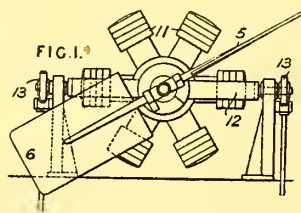
105,280. Solar Compasses. WOODWARD, C. D., 89, Westminster Street, Providence, Rhode Island, U.S.A.

Apparatus for use on an aeroplane or other moving body for indicating its direction of travel comprises a disc 1 which is

graduated with compass bearings in reverse order, and is rotated uniformly at the rate of one revolution in 24 hours, and also a style 5, the shadow of which cast by the sun gives the indication. The disc is rotated by clock-work operating through a toothed wheel 20, which rotates once in 12 hours and is geared by wheels 21, 22 to a flexible shaft 23, which turns the disc 1. The wheel 20 bears two rings of graduations reading from 0 to 179 and 180 to 0 respectively, the readings being observed through windows in a cover-plate which are marked A.M. and P.M. respectively, and being used in setting the disc 1 to its proper position. The wheel 20 is geared to the clockwork by wheels 18, 19, Fig. 3, the wheel 18 being frictionally mounted on the spindle 34, so that it may be turned by a finger-piece 35 to adjust the wheel 20 and the disc 1 independently of the clock-work. The clock-work is also provided with two sets of hour and minute hands 11, 30, and dials, the hands 11 indicating Greenwich time, and the wheels 16, 17, through which the hands 11 are operated, being carried on an arm 26 pivoted at 27, so that they can be turned out of mesh with the clock-work mechanism to permit adjustment of the hands 11 to the local time. The disc 1 may be semi-transparent, so that its markings may be read from below. The apparatus may be modified by the omission of the wheel 20 or of the hands 11. Examples of the method of using and setting the apparatus are described in the Specification, the original adjustment of the compass being

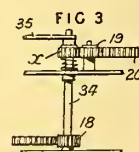
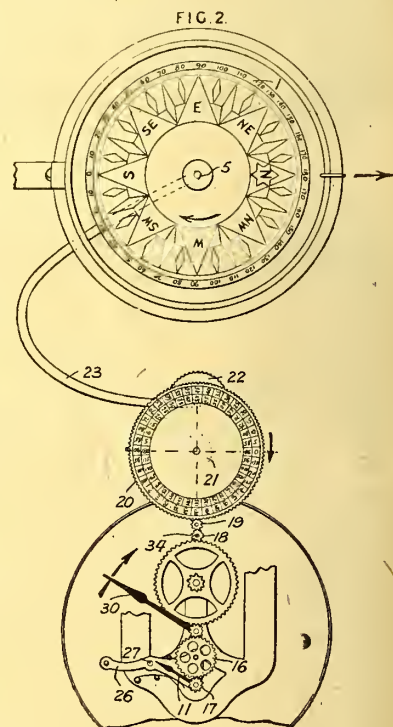


placed horizontally, vertically, or in any intermediate position. The engine shaft may also carry a screw propeller. Fig. 6 shows the application of a number of these devices to form a helicopter. A biplane is also described having two pairs of these propellers on vertical shafts in addition to a tractor screw.



105,274. Aeronautics. HUCK, J. R., 10, Bede Terrace West, Barnard Castle.

AERIAL MACHINES WITH AEROSTATS; AEROSTATS; PROPELLING; STEERING, BALANCING, AND REGULATING ALTITUDE.—An airship is supported by an adjustable aerostat having a cork framework covered with sheet cork and strengthened wire and wire netting, and is driven by adjustable fans carried by the wheels of a car or of a cycle-like structure. The aerostat, which may be circular in cross-section but otherwise of the shape shown, comprises an inner compartmented shell of sheet cork supported by a cork framework strengthened with wire, and an outer spaced frame and shell of two or three layers of sheet cork, each layer having a covering of wire mesh. The aerostat is connected at its ends by cords which pass under the pulleys shown and around a large central pulley, which can be adjusted to tilt the aerostat longitudinally. Rubber-tired wheels are carried in wide forks projecting fore and aft of the framework or car, and pairs of rectangular blades are pivotally mounted on the spokes, a spoke lying diagonally along each blade. The outer edges of the blades are connected by hooks to an auxiliary rim capable of sliding on the wheel rim and slotted to take the spoke heads. Movement of the auxiliary rim under the action of air currents thus causes simultaneous movement of the blades about their pivots. The rear wheel-fork is pivoted to move upwards or downwards 45 degrees each way and can also be turned over on





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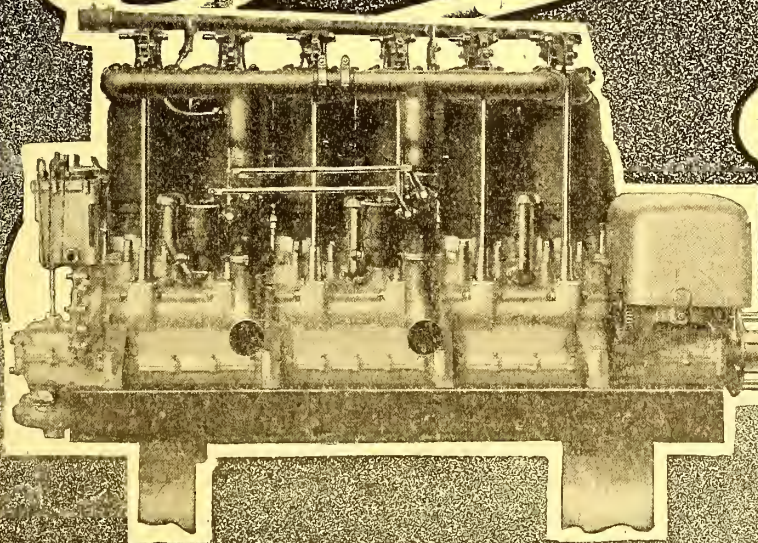


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Prices given are for quantities on usual terms.

COPPER.—There are no radical changes whatever in the Copper Market here. All supplies are, of course, being officially controlled, and there is no possibility whatever of obtaining any metal for anything but the execution of Government contracts. The present prices are fairly reasonable, as will be observed upon reference to the comparison of prices given below:—

	To-day.	May.	Apl.	Mar.	Feb.	Jan.
Copper Ingot (Std. Cash)	£130	£130	£136	£139	£134	£133
Copper Sheet	£165	£165	£174	£174	£168	£170
Copper Tube	20½d.	20½d.	20½d.	20½d.	20d.	20½d.
Brass Sheet 24G ..	16½d.	16½d.	16½d.	16½d.	16½d.	17½d.
Brass Tube S.D. ...	17d.	17d.	17½d.	17½d.	16½d.	17½d.

TIN.—There was a very strong pressure to sell exercised at the beginning of this month, but buyers were scarce, consequently prices declined considerably, and if this state of things continues, the market is bound to become easier.

Comparison of Prices.

To-day	£239 10 0
Last Week	230 10 0
June, 1916	183 10 0
Highest Price, 1916	205 0 0

LEAD.—The chief concern at the present time is supplies, and it is very difficult indeed to fulfil the requirements of works engaged on work of national importance. Contrary to expectations, supplies have recently been received from Spain: at the same time, the situation is very difficult. Official prices still remain the same.

Current Prices £30 10 0 to £29 10 0

STEEL.—A short time ago it was expected that the situation here would be relieved by large shipments being imported from U.S.A.; there does not, however, appear to be any hope of this being realised. American prices are advancing, owing to War demands, and the decrease in imports here has already become very significant.

While the demand for Aircraft Steels is increasing, the output is also on the upgrade, more firms having undertaken the manufacture of the special Steels required, with the result that the output is gradually overtaking the demand. Prices continue firm; there has not, however, been any marked advance. It must be pointed out that the Basis price for 1E Steel given below is for Blue Reeled and not Bright, the latter being very scarce indeed.

Current Average Prices.

R.A.F. 3A Steel	38s. per cwt. Basis.
R.A.F. 1E	78s. per cwt. Basis.
Sheet Steel	30s. to 31s. 6d. per cwt.

ALUMINIUM.—Supplies are still very regular, and prices continue unaltered.

Comparison of Prices.

Ingot.—June, 1917	£225
June, 1916	155
June, 1915	100
June, 1914	85

TIMBER.—The question of Timber supplies is more serious than any of the materials required for Aircraft construction. Prices remain very strong, and there is every indication that there will soon be a general advance in prices.

Current Average Prices.

Silver Spruce	15/3 to 16/0 c.f.
English Ash	13/6 to 14/6 c.f.
Walnut	2/5 to 2/7 s.f.
Mahogany	2/1 to 2/4 c.f.

Prices are for selection and delivery.

FABRIC.—Official prices remain unaltered, and supplies are fairly regular. There also appears to be good supplies of ordinary tapes and webbings.

Current Prices.

17C Cloth	29d. per yard 36 in.
Spaced Fabric	20d. per yard 37½ in.

VOLUNTARY LIQUIDATION.

WELLS AVIATION CO., LTD., 30, Whiteheads Grove, London, S.W.

Pursuant to Section 188 of the Companies (Consolidation) Act, 1908, a largely attended meeting of the creditors in this matter was held at the Cannon Street Hotel, on May 30th, the meeting having been called by Mr. A. G. Westacott and Mr. C. L. Davies, joint liquidators of the company. Mr. Westacott reminded the creditors that a meeting of some of the creditors had been held on March 19th last, when it was decided that an adjournment should be taken with a view to further investigation, and in the meantime a committee of nine of the creditors was appointed. In the interim he had had an opportunity of inspecting certain books and having an interview with the directors and also with Mr. Honeyman, the receiver appointed on behalf of the debenture holders.

At the adjourned meeting which was held certain accounts were laid before the committee, and it was ultimately decided that the directors be requested to put the company into voluntary liquidation, this being considered the preferable course and much better than going into compulsory liquidation. The approximate balance sheet, now submitted and showing the position as at March 5th, 1917, showed liabilities to share capital £8,000, debentures £73,650, and creditors, including salaries and wages due, £63,037 12s. 9d.

The assets, amounting in all to £155,380 9s. 3d., included land at Cobnor £7,885, less mortgage £3,900—£3,985, and deposit on 50 acres £240 10s.—£4,225 10s., building at Chelsea and Cobnor valued at £34,135 9s. 7d.; plant, machinery and tools, £25,240 6s. 7d.; motor-cars, £514 7s. 2d.; stock materials purchased, £30,027 18s. 11d.; work in progress, £47,264 16s.; jigs and templates, £1,034 0s. 5d.; debtors (subject to adjustment), £7,543 6s. 8d.; deposit on account purchase Benoist boat, £200; cash at bank and in hand, £373 15s. 7d.; and goodwill, £4,820 18s. 4d. The balance sheet showed that the profit for the period from April 1st, 1916, to March 5th, 1917, subject to interest on debentures and loans, depreciation and accuracy of stock valuation, amounted to £8,672 16s. 6d.

Mr. Davies addressed the meeting at great length, stating that the company had been incorporated on March 27th, 1916, to take over the business of aviation works carried on by Mr. R. F. Wells. The consideration amounted to £8,000, and this was satisfied by the issue to Mr. Wells of £7,998 in fully-paid shares and £2 in cash. No cash, except the £2, was paid in connection with the purchase. The intention was, as soon as the opportunity occurred, to get further capital into the business. At the date on which the company took over the business the assets were estimated at £15,960.

The conditions of the sale of the company provided that Mr. Wells should be appointed managing director at £1,200 per annum, with ten per cent. on the net profits. The business became a controlled establishment in May, 1916. The company received in the period from August 26th to October 2nd orders

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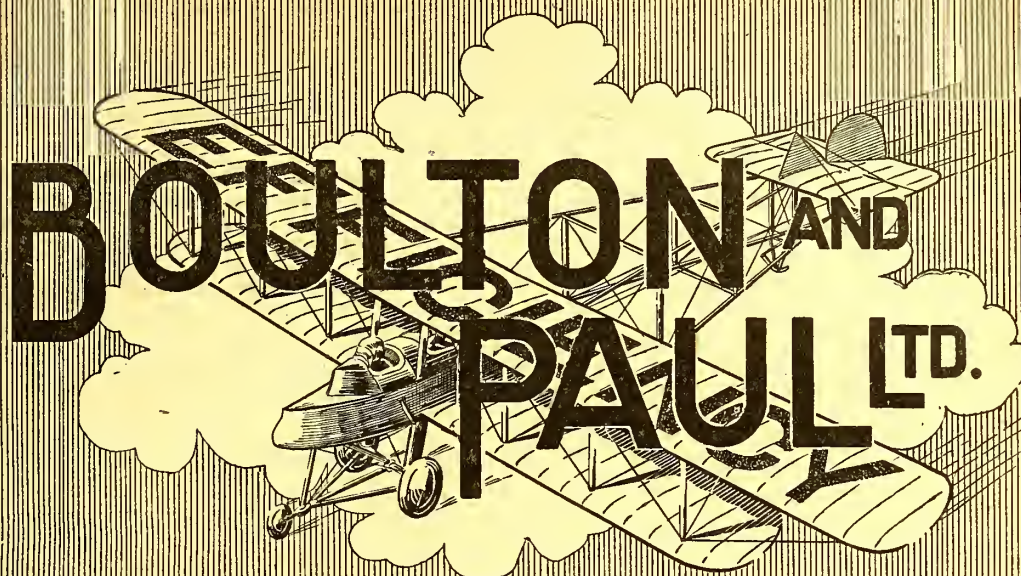
Crown Works, Barford Street.

Telephone: Regent 5910.
Telegrams: "Windefactor, London."

Telephone: Midland 2123.
Telegrams: "Auster, Birmingham."

TELEGRAMS "AVIATION" NORWICH.

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TELEGRAMS: "GWYNNE, LONDON."

KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.

to the tune of £176,637, and, no doubt, the difficulties which had accrued were due to taking orders for such large amounts and the necessity which arose of spending considerable sums of money on buildings, plants and machinery.

Mr. Davies explained how the company went to the War Office and obtained from them advances amounting to £30,000 in three instalments of £10,000 each. Another advance was made by the War Office of £5,000 on January 18th last, and a little later another £10,000. There was then taken from Mr. Wells an undertaking that if this amount was not repaid at the end of February then debentures should be issued including that amount and any other amounts owing. It became necessary subsequently for Mr. Wells to again seek financial help from the War Office, and they then insisted on debentures being given to them. This caused the bank to take certain action in respect of their overdraft, but the War Office provided the money to pay off the bank. Subsequently Mr. Honeyman had been appointed receiver on behalf of the debenture holders.

It appeared that the sales for the 11 months, from April 1st, 1916, down to March, 1917, were £118,582, and there was a net profit on the trading, after charging all expenses, of £10,895. The liquidator stated that of the debentures amounting to £73,650, £46,650 had been advanced prior to the actual issue of the debentures, and it was considered that these debentures could not hold good in the liquidation. It appeared, therefore, that of the £73,650 now stated to be secured by debentures, £27,000 only was valid, and it was believed that in respect of the £46,650 of debentures the holders must rank *pari passu* with the creditors.

A considerable discussion ensued at the meeting, in the course of which Mr. Simone, solicitor, read counsel's opinion concerning the debentures, this opinion being to the effect that the debentures were only good for £27,000 in his (counsel's) opinion.

In the course of further discussion the opinion was expressed that the interests of the creditors would be far better served by the company being wound up voluntarily than under a compulsory order, and it was eventually resolved that the voluntary liquidation be continued, with Mr. A. G. Westacott and Mr. C. L. Davies as liquidators, with an informal committee consisting of the following:—Vickers, Ltd.; York Street Weaving Co.; Young and Co., Ltd.; Aircraft Supplies, Ltd.; Lang Propeller Co.; Coventry Repetition Co.; Hibberd Bros., Ltd.; W. H. Heywood and Co.; and Messrs. Greenhill and Son.

The following are among the chief creditors:—

Aublett, Harry, and Co., Ltd., London	£ 262
British Oxygen Co., Ltd., London	231
Bowley, A., and Son, London	227
Brown Bros., Ltd., London	505
Bailey and White, Ltd., Portsmouth	1,445
Blackburn and Co., London	436
Bullivant and Co., Ltd., London	337
British Aluminium Co., London	576
Bowring Petroleum Co., Ltd., London	425
Bell's Assurance Association, London	300
British Luxfer Prisms Syndicate, Ltd., London	420
Cridlan, A. S., Emsworth	313
Chelsea Electric Supply Co., London	461
Coventry Repetition Co., Ltd., Coventry	909
Cellon, Ltd., London	630
Elmo Motor Garage, London	290
Edison and Swan Electric Light Co., London	202
Engert and Rolfe, Ltd., London	306
Foster and Tattersall, Ltd., London	260
Fenton and Baines, London	406
"Flight," London	258
French, E. O., Coventry	555
Green and London, London	354
Gas, Light and Coke Co., London	410
Griffin, E., and Co., London	538
Greenhill and Sons, London	718
Heywood, W. H., and Co., Huddersfield	667
Hibberd Bros., London	790
Harding, Vick and Howard, London	508
Herring and Son, Chertsey	240
Howard Bros. and Co., London	372
Haynes, Eustace L., London	229
Imperial Light, Ltd., London	342
Latham, Jas., Ltd., London	672
Lysaght, John, Ltd., London	400
Lang Propeller, Ltd., Weybridge	995
Melhuish, R., Ltd., London	505
Mallinson, W., and Sons, Ltd., London	322
Minter, F. G., London	427
Midgley and Sutcliffe, Bradford	595
Mercer, S., and Co., London	202
Oliver, W., and Sons, Ltd., London	865
Parsons, T., and Son, London	332
Pathe Freres, Paris	492
Rubery, Owen and Co., Darlaston	552
Rotax Motor Accessories, Ltd., London	320
Simon, Haynes and Ireland, London	582

Selsdon Engineering Co., London	431
Singer Manufacturing Co., Clydesbank	376
Sagar, J., and Co., Halifax	201
Sunderland, L., and Co., London	302
Underwood Typewriter Co., Ltd., London	380
Vickers, Ltd., London	12,799
Venesta, Ltd., London	250
West Sussex Brick Co., Chichester	253
Willis, Rowland and Co., London	258
York Street Weaving Co., Ltd., London	2,499
Young, H., and Co., Ltd., London	2,161

AMERICAN STANDARDISATION.

A meeting of the Aeronautic Division of the Society of Automotive Engineers was held April 20th in New York, those present being Chairman Charles M. Manly, H. M. Crane, F. S. Duesenberg, Spencer Heath, C. B. King and J. G. Vincent, General Manager Coker F. Clarkson and Recorder A. C. Woodbury. The visitors present were: Frank W. Caldwell, Aviation Section, Signal Corps, and M. W. Hanks, of the Westinghouse Electric and Manufacturing Co.

The Division voted to report for adoption the Deperdussin (Dep) and stick controls for aeroplanes.

It was decided to recommend that clincher rims, conforming to the standards of the Clincher Automobile Tyre Manufacturers' Association, should be specified for aeroplanes. The rim sizes to be recommended are 24 by 3½, 28 by 4, and 32 by 4½ in. Tyres of corresponding sizes are to be used with these rims, as are also oversize tyres as follows: 25 by 4, 29 by 4½, and 33 by 5 in.

Considerable discussion was had regarding the standardisation of hubs and spokes. It was thought that three sizes of hubs, 6, 7 and 8 in. long, would be sufficient, but it was finally decided to consider the subject again at the next meeting of the Division. Proposals were also submitted for standardising two sizes of wire spokes, the large size having the butt end bent to an angle of 4½ deg. and the small size an end bent to an angle of 90 degs.

It was voted to recommend the method of fastening ends of hard wires corresponding to the present British standard. This consists of an oval coil of wire, through which the hard wire is slipped, bent in the form of a loop, inserted again and the end bent over against the coil, the hole then being soldered.

Dimensions were submitted for flexible splices for cables from 3/32 to 7/32 in. diameter. It was voted that these splices be proposed for standardisation. Dimensions were also submitted for galvanized non-flexible cable ends for cables of from 1/16 to ½ in. diameters. These splices will probably be recommended.

A set of thimbles for wire ends has been approved for submission to the Standards Committee. These apply to wire of from 1/16 to ¾ in. diameter.

The subject of turnbuckles was considered, and it was decided to recommend for immediate adoption short and long turnbuckles, the barrels of which are 2 and 4 in. long, respectively.

It was decided to approve the following pipe-line markings for presentation to the Standards Committee: Gasoline (petrol) pipe lines are to be marked with red tapes ½ in. wide, painted around the pipes 24 in. apart. Oil lines are to be marked with white stripes ½ in. wide, painted around the pipes 24 in. apart.

The following recommendation was approved with regard to specifications for thickness of metal:

"Sheet metal is to be specified by thickness in decimal fractions of an inch. Rods, wires and cables are to be specified by diameter in decimal fractions of an inch. Tubes are to be specified by outside diameter in inches or fractions and thickness of wall in decimal fractions of an inch."

It was voted to recommend the following engine-support dimensions for adoption, omitting all reference to sizes of bolts:

Distance between timbers	12	14	16
Width of bed timbers	2	2½	2½
Distance between centres of bolts ...	14	16½	18½

A resolution was passed that in view of the necessity of arriving at standards that will mean the least possible delay in the production of aeroplane parts, the Division recommends the use of the English system of measurement, except in isolated cases, such as spark-plug threads, for which the metric system is desirable in order to effect interchangeability with some well-established standard.

It was decided to approve a metric spark-plug with an 18-mm. thread and 1½-mm. pitch. The form of the thread is to be the International metric standard. The distance from the gasket shoulder to the end of the shell is to be ¾ in. The hexagon is to be 1 in. across the flats.

The following list of existing S.A.E. Standards was approved for aeronautic practice—steel specifications, heat treatments, test specimens, ball-bearing sizes, throttle levers, magneto dimensions and cotter pin sizes.

Other matters approved for submission to the Standards Committee are a design of tachometer shaft-end and a safety belt adopted by the War Department.

WAR OFFICE AND ADMIRALTY CONTRACTORS.

PLANES

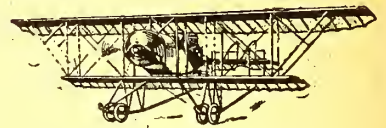
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TELEGRAMS—

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THE AEROPLANE BUYERS' GUIDE.

ACETYLENE WELDING PLANT—

Imperial Light, Ltd., 123, Victoria St., S.W.

AEROPLANE MANUFACTURERS—

Aircraft Manufacturing Co., Ltd., 47, Victoria St., S.W.

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds

Boulton & Paul, Ltd., Rose Lane Works, [Norwich]

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol

British Caudron Co., Ltd., Broadway, Cricklewood, N.

Central Aircraft Co., Palmerston Works, High Rd., Kilburn, N.W.

Curtiss Aeroplane Co., L. J. Seely, Clun House, Surrey St., Strand, W.C.

Davidson Aviation Co., Ltd., Hammersmith, W.

Eastbourne Aviation Co., Ltd., Eastbourne

Grahame-White Aviation Co., Ltd., London Aerodrome

Handley Page, Ltd., 110 Cricklewood Lane, N.W.

Mann, Egerton & Co., Aircraft Works, Norwich

Martinsyde, Ltd., Brooklands, Byfleet

National Aircraft Co., Ltd., 15, Hackney Rd., N.E.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2

Norman-Thompson Flight Co., Ltd., Bognor

Roe, A. V., & Co., Ltd., Manchester

Sage, F., & Co., Ltd., Peterborough

Saunders, S. E., Ltd., East Cowes, I.O.W.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W. [Thames]

Sopwith Aviation Co., Ltd., Kingston-on-

Standard Aircraft Manufacturing Co., Eppingham House, Arundel St., W.

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.

Waring & Gillow, Ltd., Hammersmith

Westland Aircraft Works, Yeovil

White, J. Samuel, & Co., Ltd., East Cowes

AIRSHIPS—

Airships Ltd., 47, Victoria St., S.W.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W.

ALUMINIUM CASTINGS—

Coan, R. W., 219, Goswell Rd., London, E.C.

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3. [Rugby]

Willans & Robinson, Ltd., Victoria Works,

ANNEALING FURNACES

Fletcher, Russell & Co., Ltd., 15 Fisher Street, Southampton Row, W.C.

BEARINGS (Btonia Cast Phosphor

Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds

BORRODIZING—

The Deptford Steel & Iron Works, Ltd., 1 and 2, Old Pye St., Westminster

BRASS SHEETS FOR TIPPING

PROPELLERS—

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3.

BUILDINGS—

Boulton & Paul, Ltd., Rose Lane Works, Norwich

Fairby Construction Co., Ltd., 117, Victoria St., Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey

The Wilfley Co., Ltd., Salisbury House, London

CARBURETTORS—

Hobson, H. M., Ltd., 29, Vauxhall Bridge Road

CASTINGS—

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3.

CASTINGS (Aluminium)—

Coan, R. W., 219, Goswell Road, London, E.C.

Willans & Robinson, Ltd., Victoria Works, Rugby

CELLON DOPE—

Cellon Ltd., Broad St. House, New Broad St., E.C.2

CLOTHING—

Burberry's Ltd., Haymarket, S.W.

Dunhill's Ltd., Euston Rd., N.W.

Hazel & Co., 4, Princes St., Hanover Sq., W.

Robinson & Cleaver, Ltd., Regent St., London

COMPONENT PARTS—

Accles & Pollock, Ltd., Oldbury, Birmingham

B. D. V. Aircraft Spares, Syon Chambers, 16A, Kew Road, Richmond, Surrey

Central Aircraft Co., Palmerston Works, High Rd., Kilburn, N.W.

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland

CORDS, TAPES AND THREADS—

MacLennan, J., & Co., 30, Newgate St., E.C.1., and at Glasgow

DOPES—

British Aeroplane Varnish Co., Ltd., Milburn House, Newcastle-on-Tyne, and 166, Piccadilly

British Cellulose Co., Ltd., 8, Waterloo Place, Cellon Ltd., Broad St. House, New Broad St

ELASTIC CORDS—

Tubbs, Lewis, & Co., 29 & 30, Noble St., E.C.2.

ELECTRICAL ACCESSORIES—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex

ENGINES AND PARTS—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford

Arrol-Johnston, Ltd., Dumfries

Beatty School of Flying, Ltd., London Aerodrome

Beardmore Aero Eng., Ltd., 112, Great Portland Street

Dudbridge Iron Works, Ltd. (Salmson), 87 Victoria St., London, S.W.

Gordon Watney & Co., Ltd., Weybridge

Green Engine Co., Ltd., Twickenham

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W.

Sturtevant Motors Co., 147, Queen Victoria St.

Sunbeam Motor Car Co., Ltd., Wolverhampton

The Gnome & Le Rhone Engine Co., Ltd., 47, Victoria St., S.W.

Willans & Robinson, Ltd., Victoria Works, Rugby

FLYING SCHOOLS—

Bournemouth Aviation Co., Ltd., Talbot Village, Bournemouth

Dutton Aircraft, Chester Aerodrome, Chester

GAUVANISING—

Cowper-Coles Manufacturing Co., Sunbury-on-Thames

Boulton & Paul, Ltd., Rose Lane Works, [Norwich]

GEARS

Moss Gear Co., Ltd., Thomas St., Aston, Birmingham

GLUE—

Adams & Co., Ltd., West Bromwich

Improved Liquid Glues Co., Ltd., Gt. Hermitage Street. (Croide.)

Mendline Co., 8, Arthur St., E.C.

GOGGLES—

Triplex Safety Glass Co., Ltd., 1, Albemarle St., Piccadilly, W.1.

GYROSCOPES—

The Sperry Gyroscope Co., Ltd., 15, Victoria St., London, S.W.

HEATING AND VENTILATING—

Comyn, Ching & Co., Ltd., Castle St., Long Acre, W.C.

Chas. P. Kinnell & Co., Ltd., 65 & 65a, Southwark St., London, S.E.1.

INSTRUMENTS—

British Wright Co., Ltd., 33, Chancery Lane

MACHINE TOOLS—

Bliss, E. W., Co., 2a, Pocock St., Blackfriars Rd., London, S.E.

Brewster & Co., 11, Queen Victoria St., E.C.

MAGNETOS—

The M-L Magneto Syndicate, Ltd., Victoria Works, Coventry

METAL MANUFACTURERS—

Chas. Clifford & Son, Ltd., Birmingham

METAL PARTS AND FITTINGS—

Accles & Pollock, Ltd., Oldbury, Birmingham

Aircraft Supplies Co., Ltd., 17, John St., Theobald's Road, W.C.

Bayliss, Jones & Bayliss, Ltd., Wolverhampton (Bolts and Nuts)

The Birmingham Guild, Ltd., 45, Gt. Charles St., Birmingham

Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds

Foster Engineering Co., Wimbledon

Mann, Egerton & Co., Ltd., Aircraft Works, Norwich

Mountford, Fredk., Ltd., Fremo Works, Lifford, Birmingham

Rubery, Owen & Co., Ltd., Darlaston

Sankey, Joseph, & Sons, Ltd., Wellington, Shropshire

Selsdon Engineering Co., Ltd., Croydon

Thompson Bros., Ltd., Bradley, Bilston

METALS IN GENERAL—

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3.

METRIC BOLTS—

Cashmore Bros., Zota Works, Hildreth St., Balham, S.W.

MISCELLANEOUS—

Anderson, D., & Son, Ltd. (Roofs), Belfast

Anti-Glare Glass Co., Ltd., 78, Turnmill St., E.C.

Bowden Wire, Ltd., Willesden Junction

Brown Bros., Ltd., Great Eastern St., E.C.

Edison Swan Electrical Co., Ponders End (Lamps)

Herbert Frood Co., Ltd., Chapel-en-le-Frith

Glasse Manufacturing Co., Ltd., 211, City Rd., E.C.

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PATENT AGENTS—

King's Patent Agency, 165, Queen Victoria St.

Page & Rowlingston, 27, Chancery Lane, W.C.

Stanley, Popplewell & Co., 38, Chancery Lane

PISTON RINGS—

British Chuck & Piston Ring Co., Coventry

PROPELLERS—

Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds

Ebora Propeller Co., 11 & 12, Surbiton Park Terrace, Kingston-on-Thames

Integral Propeller Co. Ltd. Hendon

Lang Propeller, Ltd., Weybridge

Oddy, W. D., & Co., Leeds

Westland Aircraft Works, Yeovil [Norwich]

Boulton & Paul, Ltd., Rose Lane Works,

RIGGING FOR AIRCRAFT—

Craddock, G., & Co., Ltd., Wakefield, England

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The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex

SAFETY BELTS—

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SAND AND DIE CASTINGS—

Coan, R. W., 219, Goswell Rd., London, E.C.

SCIENTIFIC INSTRUMENTS—

The Foster Instrument Co., Letchworth, Herts

SEAPLANE MANUFACTURERS—

Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds

The Norman Thompson Flight Co., Ltd., Middleton, Bognor

Short Bros., Rochester

Supermarine Aviation Co., Ltd., Southampton

SEATS FOR AEROPLANES—

Bowser, E., Art Cane Works, 50, Park Lane, Leeds. Telephone, Central 3473

SHEET METAL PRESSINGS

Accles & Pollock, Ltd., Oldbury, Birmingham

Blackburn Aeroplane and Motor Co., Ltd., Olympia, Leeds

Jacobs, W. A. & R. J., Ltd., 94 & 96, Leonard St., Finsbury, E.C.

London Aluminium Co., Ltd., Westwood Road, Aston, Birmingham

Nicholls & Lewis, Ltd., 16, Princep St., B'ham

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Tubbs, Lewis & Co., 29 & 30, Noble St., E.C.2

SPARKING PLUGS—

Forward Motor Co., Summer Row, Birmingham

Hobson Manufacturing Co., 29, Vauxhall Bridge Rd., S.W.

Lodge Sparking Plug Co., Ltd., Rugby

Ripault, Leo, & Co. Ltd., (Oleo Plugs), 64a, Poland St., W.

SPRINGS—

Dart Spring Co., West Bromwich

STEEL—

Nicklin, Bernard, & Co., Birmingham

Firth, Thos., & Sons, Sheffield

STEEL TENSION WIRES—

Craddock, G., & Co., Ltd., Wakefield, England

STEEL TUBES for AEROPLANES—

Accles & Pollock, Ltd., Oldbury, Birmingham

TAPER PINS—

Fredk. Mountford (Birmingham) Ltd., Fremo Works, Lifford, Birmingham

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R. F. & F. W. Brown, Wollaton Saw Mills, nr. Nottingham.

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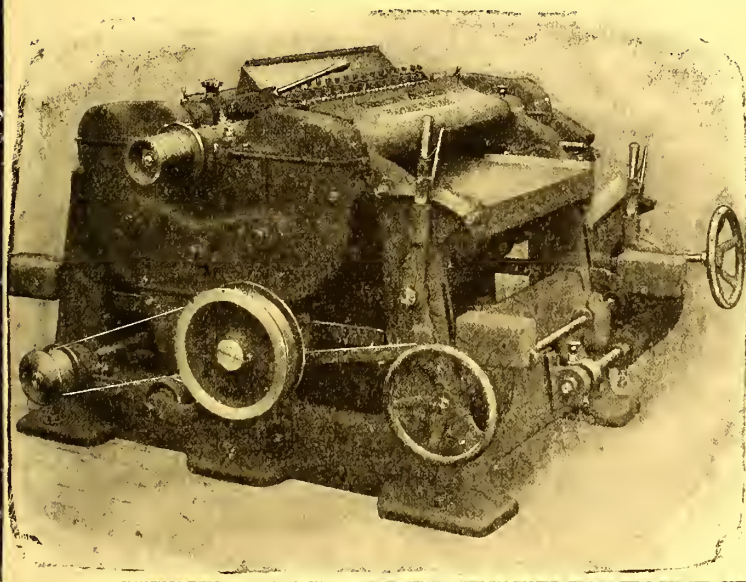
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KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.

(Continued from page 1528.)

Reported June 12th.

ACCIDENTALLY KILLED.—Chuter, Flt. Sub-Lt. J. W., R.N.

Henton, Sub-Lt. A. W., R.N.V.R.

MISSING.—Reeves, Flt. Lt. F. P., R.N.

Culling, Flt. Lt. T. G., R.N.

Swinburne, Flt. Sub-Lt. T. R., R.N.

WOUNDED.—Stackard, Flt. Sub-Lt. H. F., R.N.

Keens, Flt. Sub-Lt. J. H., R.N.

ROYAL NAVAL DIVISION.—PREVIOUSLY REPORTED MISSING, NOW OFFICIALLY PRESUMED TO HAVE BEEN KILLED.—Heald, Lt. I., R.N.V.R., attd. R.F.C.

PERSONAL NOTICE.

DEATHS.

DUNCAN.—Flt. Sub-Lt. David Alan Duncan, R.N., whose death was announced last week, was the only son of Mr. and the late Mrs. G. H. F. Duncan, of Afton Lodge, Freshwater, Isle of Wight, and 3, York House, Church Street, Kensington, W. He was 21 years of age.

ELLIS.—Flight Sub-Lieut. Oliver Bernard Ellis, R.N., second son of Mr. Bernard Ellis, of Avenue Road, Leicester, was reported missing on May 20th, but information has been received which leaves little doubt that he was killed in an encounter with a superior force of German aeroplanes over the German lines.

Mr. Ellis, who was not yet 19, was educated at the schools of the Society of Friends at Sidcot, Somerset, and Bootham, Yorks. He joined the Royal Naval Air Service in June, 1916, and was sent on active service last March. He was an undergraduate of St. John's College, Cambridge, but had not taken up residence there.

MAXWELL.—Sub-Lieut. John Earle (Jock) Maxwell, R.N.A.S., who was killed in action on March 30th, while flying, was the elder son of Mr. and Mrs. J. A. Maxwell, of 84, Dartmouth Road, Brondesbury, N.W. He was aged 24.

TRECHMANN.—On June 3rd, there died at Constantinople, whilst prisoner of war, after having been shot down on March 30th whilst on a bombing expedition, Flt. Sub-Lt. Bertram A. Trechmann, R.N.A.S., youngest son of Mr. and Mrs. Albert F. Trechmann, "Kiora," Stockton-on-Tees, aged 19 years.

MILITARY.

G.H.Q. COMMUNIQUÉS.

JUNE 5th, 6.30 p.m.—There was great activity in the air again this day, and bombing was continued by day and night with good results.

Twelve German aeroplanes were brought down in air fighting, one of which fell within our lines, and six other hostile machines were driven down out of control.

Five of our aeroplanes are missing.

JUNE 6th, 9.10 p.m.—Activity in the air continued yesterday.

Eight German aeroplanes were brought down in air fighting, one of which fell within our lines, and eight other hostile machines were driven down out of control.

Seven of our machines are missing.

JUNE 7th, 9.50 p.m.—There was again great activity in the air yesterday, and many fights took place.

Five hostile formations, one of which consisted of over 30 machines, were attacked and dispersed with heavy casualties.

In the course of the fighting nine German aeroplanes were brought down and at least nine others were driven down out of control.

Six of our aeroplanes are missing.

JUNE 8th, 10.15 p.m.—During the battle our aircraft yesterday co-operated very successfully with both infantry and artillery, performing valuable services.

In addition, a large number of successful air raids were carried out, during which the enemy's aerodromes, balloons, trains, billets, depots, and troops were attacked with bombs and machine-guns. The enemy aircraft were prevented from taking part in the battle.

We accounted for 12 German machines brought down and eight others driven down out of control.

Fourteen of our machines are missing.

JUNE 9th, 9.20 p.m.—In the course of bombing raids carried out by our aeroplanes against the enemy's railway stations on the night of the 7th-8th inst., a large accumulation of rolling stock containing ammunition was detonated by a bomb. The fires and explosions caused continued until dawn.

Yesterday three German aeroplanes were brought down in air fighting and four others were driven down out of control.

Six of our aeroplanes are missing. Two of these were lost as the result of a collision during a fight with a number of hostile machines over the enemy's lines.

JUNE 10th, 8.57 p.m.—Six German aeroplanes were brought down yesterday in air fighting, and three other hostile machines were driven down out of control.

Three of our aeroplanes are missing.

WAR OFFICE COMMUNIQUÉ.

JUNE 6th.—Our aviators have successfully bombed the enemy camps at Gaza, Hareira, and Beersheba.

The G.O.C. the British Forces in German East Africa reports: "JUNE 8th.—Successful bombing raids against enemy depots at Tunduru (midway between Lake Nyasa and the coast, 45 miles north of the Rovuma) and Liwale (120 miles south-west of Kilwa) have been carried out by our Air Service).

HOME COMMAND COMMUNIQUÉS.

JUNE 5th, 6.30 p.m.—An aeroplane raid is now in progress over the estuary of the River Thames.

The enemy have dropped bombs over the adjoining district of Essex and Kent.

No further details are yet to hand.

Up to the present one hostile machine has been reported as having been brought down.

10.15 p.m.—The aeroplane raid this evening was carried out by a squadron of about 16 aeroplanes.

These aeroplanes came in over the Essex Coast about 6.15 p.m.

They dropped some bombs in the country and small towns in Essex, and then proceeded to attack the Naval Establishment in the Medway.

A considerable number of bombs were dropped, and a certain amount of damage was done to house property, but the damage done to naval and military establishments is practically negligible.

The raiding aeroplanes were engaged by gunfire and pursued by aircraft; after having lost two machines they made off to sea.

The casualties so far reported are:—2 killed, 2 dangerously wounded, and 27 wounded.

JUNE 6th, 3.50 p.m.—Full police reports which have now been received show that the total casualties in yesterday's air raid were as follows:—

Killed—12.

Injured—36

The material damage was not great.

[See Admiralty and German communiqués.]

THE CASUALTY LIST.

Reported June 6th.

KILLED.—Coates, Sec. Lt. S., R.F.C.

O'Sullivan, Sec. Lt. J. A., R.F.C.

Tennant, Sec. Lt. H., Drag. Gds., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—

Hall, Sec. Lt. C. S., R.F.C.

WOUNDED.—Blofeld, Sec. Lt. H., R.F.C.

Hunter, Sec. Lt. W. A., Yorks. L.I., attd. R.F.C.

Ord, Sec. Lt. B., R.F.C.

MISSING.—Carey, Sec. Lt. A. S., R.F.C.

Robertson, Sec. Lt. G. M., High. L.I. and R.F.C.

Smith, Sec. Lt. C. F., L'pool R. and R.F.C.

PREVIOUSLY REPORTED PRISONERS, NOW REPORTED WOUNDED AND PRISONERS IN GERMAN HANDS.—Whitehead, Lt. A. D., R. War. R., attd. R.F.C.

Knight, Sec. Lt. N. L., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Brockhurst, Sec. Lt. G. N., R.F.C.

Davies, Lt. H. R., R.E., attd. R.F.C.

Dilnutt, Lt. E. J., R.F.C.

Russell, Lt. W. O., R.F.C.

Tasker, Sec. Lt. W. T. B., R.F.C.

Wischer, Sec. Lt. J. V., R.G.A., attd. R.F.C.

Wood, Lt. A. W., R.F.C.

CANADIAN CONTINGENT.—WOUNDED.—Anglin, Lt. J. T., Cent. Ont. R., attd. R.F.C.

Caudwell, Capt. N. S., Inf., attd. R.F.C.

MISSING.—Cotton, Lt. H. H., Inf., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—McCallum, Lt. A. H. K., Gen. List, attd. R.F.C.

Reported June 7th.

KILLED.—Fuller, Lt. L. A., Durham L.I. and R.F.C.

WOUNDED.—Bigg-Wither, Sec. Lt. A. O., R.F.C.

Castle, Sec. Lt. G. L., R.F.A., attd. R.F.C.

Hallam, Sec. Lt. E. W., Yeomanry and R.F.C.

Kelly, Lt. E. C., Royal Dublin Fusiliers, attd. R.F.C.

Wilkinson, Sec. Lt. G. M., Duke of Cornwall's L.I., attd. R.F.C.

Wray, Sec. Lt. A. M., The Buffs, attd. R.F.C.

MISSING.—De Selincourt, Capt. A., R.F.C.

Hume, Lt. S. S., Yeomanry and R.F.C.

Lloyd, Sec. Lt. E. A., Yeomanry and R.F.C.

McArthur, Capt. L. W., M.C., Hon. Artillery Co. and R.F.C.

Phalen, Sec. Lt. R. U., R.F.C.

Roberts, Lt. R. M., King's Own (Y.L.I.), attd. R.F.C.

Smith, Lt. V., Northumberland Fusiliers, attd. R.F.C.

Stevens, Sec. Lt. E. H., East Lancashire Regt., attd. R.F.C.

PREVIOUSLY REPORTED PRISONER, NOW REPORTED WOUNDED AND PRISONER IN GERMAN HANDS.—Lees, Capt. A., Royal West Kent Regt., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Bell, Sec. Lt. E. A. V., Hampshire Regt. and R.F.C.

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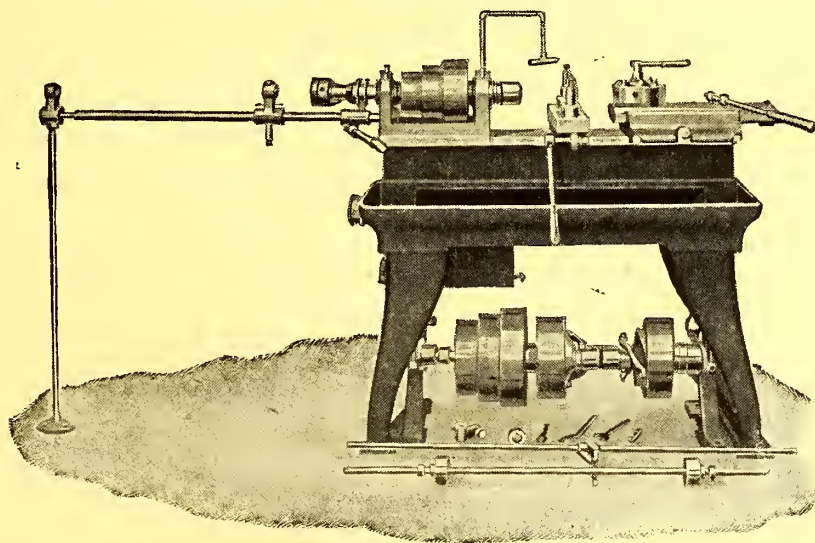
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Boughton, Sec. Lt. C. B., Welsh Regt., attd. R.F.C.
 Davis, Sec. Lt. H., East Yorkshire Regt., attd. R.F.C.
 Holmes, Sec. Lt. C. W. D., Bedfordshire Regt. and R.F.C.
 Owen, Lt. H. W., R.F.C.
 Roche, Sec. Lt. S., R.F.C.
 Tidmarsh, Capt. D. M., M.C., Royal Irish Regt., attd. R.F.C.
 Worsley, Sec. Lt. R. S. L., R.F.C.

Reported June 8th.

KILLED.—Glynn, Sec. Lt. B. J., R.F.C.
WOUNDED.—Gavin, Lt. S., Devon R. and R.F.C.
MISSING.—Southorn, Lt. T. M., R.F.A. and R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Craig, Sec. Lt. F. C., R.F.C.
 Heagerty, Sec. Lt. J. S., Buffs, attached R.F.C.
 Hicks, Lt. G. E., R.F.C.
 Kirkham, Sec. Lt. F. J., R.F.A., attached R.F.C.
 Middleton, Sec. Lt. J. R., R.F.C.
 Rickards, Sec. Lt. A. R. M., R.F.C.
 Stewart, Lt. D. J., York and Lancaster, attached R.F.C.
DIED OF WOUNDS.—R.F.C.—Wynn, 77920 2nd Cl. Air Mech. J. H. (Pontypool).
AUSTRIAN FORCES.—**WOUNDED.**—Jones, Capt. A. M., Flying Corps.

Reported June 9th.

KILLED.—Morgan, Sec. Lt. J. A., Shrops. L.I. attd. R.F.C.
 Murray, Sec. Lt. J. L., R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—
 Browning, Capt. S. F., R.F.C.
 Johnston, Sec. Lt. A. R., R.F.C.
 Shepherd, Capt. J. M. E., Rif. Brig., attd. R.F.C.
 Smith, Sec. Lt. J., R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS.—
 Evans, Sec. Lt. F. W., Middlesex Regt., attd. R.F.C.
WOUNDED.—Moore, Maj. J. H., R.F.C.
 Scott, Sec. Lt. W. P., R.F.C.
 West, Sec. Lt. R. W. G., S. Staff. Regt. and R.F.C.
 Worrall, Lt. E. A., R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS AS PRISONERS IN GERMAN HANDS.—Allinson, Sec. Lt. F., R. W. Surrey Regt., attd. R.F.C.
 Harryman, Sec. Lt. S., Glouc. Regt., attd. R.F.C.
 Ross, Lt. J. K., R.F.C.
 Tomlinson, Capt. H., M.C., R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Woolley, Lt. D. B., R.F.C.
WOUNDED AND PRISONER IN TURKISH HANDS.—Lander, Lt. T. E., M.C., Highland L.I., attd. R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND PRISONERS IN GERMAN HANDS.—Fraser, Sec. Lt. A., R.F.C.
 Johns, Lt. R. A. P., Hrs., attd. R.F.C.
 Johnstone, Sec. Lt. J., R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Holmes, Sec. Lt. J. D. V., R.F.C.
 Houghton, Sec. Lt. D. L., Middx. Regt., attd. R.F.C.
 Lines, Sec. Lt. T. H., R.F.C.
 Macintosh, Sec. Lt. R. R., R. Scots Fus., attd. R.F.C.
 Millar, Sec. Lt. T. S., R. Scots, attd. R.F.C.
ACCIDENTALLY KILLED.—R.F.C.—Roberts, 8106 Sgt. W. B. (Cophthorne, Shrewsbury).

Reported June 11th.

KILLED.—Inchbold, Lt. G., Sher. For., attd. R.F.C.
 Nixon, Sec. Lt. A. W. L., R.F.C.
 Perkins, Sec. Lt. T., R.F.C.
 Sleeman, Sec. Lt. W. F., R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—
 Ball, Capt. A., V.C., D.S.O., M.C., Sher. For. and R.F.C.
 Eccles, Lt. C. G., R.F.C.
 Ewen, Capt. G. T., Manch. R.
 Fraser, Sec. Lt. W., R.F.C.
 Taylor, Sec. Lt. H. A., R. W. Kent R., attd. R.F.C.
DIED OF WOUNDS.—Knight, Sec. Lt. A. J., Sher. For.
 Leake, Sec. Lt. G. E. A., Lond. R.
 Martinson, Sec. Lt. K. L., R.F.C.
MISSING.—Lister, Sec. Lt. B. S., R.F.C.
 O'Longan, Sec. Lt. P. C. S., R. Ir. Regt., attd. R.F.C.
 Rowe, Lt. B. F., R. Fus., attd. R.F.C.
 Stewardson, Lt. E. A., R. W. Surr. R. and R.F.C.
PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Burns, Sec. Lt. V. L. A., R.A.F. and R.F.C.
 Davies, Sec. Lt. J. E., Lond. R. and R.F.C.
 Martin, Lt. A. W., Yorks R. and R.F.C.
HOME FORCES.—MAY 21st.—**MISSING.**—R.F.C.—Hadlow, 65249 2nd Cl. Air Mech. F. (Woolwich, S.E.)
 MAY 22nd.—**MISSING.**—R.F.C.—Bonner, 1897 P. (Guildford), 1st Cl. Air Mech.

MAY 28th.—**MISSING.**—R.F.C.—Barnes, 42054 2nd Cl. Air Mech. E. W. (Hull); Barrie, 40213 2nd Cl. Air Mech. V. M. (Richmond); Jones, 44854 2nd Cl. Air Mech. R. H. (Hammer-smith, W.); Langridge, 1908 Cpl. E. (Bournemouth); Wood, 61869 2nd Cl. Air Mech. (Cloughton).

INDIAN FORCES.—**MISSING.**—Dickinson, Lt. T. M., Cav., attd. R.F.C.

CANADIAN CONTINGENT.—**KILLED.**—Dick, Lt. G. M., Manitoba R., attd. R.F.C.

McKissock, Lt. W. E., Cent. Ont. R., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—

Masson, Lt. R. G., East Ont. R., attd. R.F.C.

Nicholson, Lt. H. R., Pioneers, attd. R.F.C.

WOUNDED.—Bennett, Lt. C. N., Quebec R., attd. R.F.C.

Trotter, Lt. M. T., Quebec R., attd. R.F.C.

MISSING.—Bourinot, Lt. A. S., Quebec R., attd. R.F.C.

Kantel, Lt. F. W., Art., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—French, Lt. C. E., East Ont. R., attd. R.F.C.

Reported June 12th.

KILLED.—Ritter, Lt. W. H., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS.

—Anthony, Lt. J. R., R. Welsh Fusiliers and R.F.C.

WOUNDED.—Gyles, Sec. Lt. R. R., R.F.A., attd. R.F.C.

MISSING.—Barrie, Sec. Lt. F., R.F.C.

Cameron, Lt. D. R., R.F.C.

Waters, Sec. Lt. H. E., R.F.C.

PREVIOUSLY REPORTED WOUNDED, NOW REPORTED DIED OF WOUNDS.—R.F.C.—Imber, 17754 2nd Cl. Air Mech. D. W. (Surbiton).

PERSONAL NOTICES.

DEATHS.

HIGGS.—At the inquest at Northampton on June 11th on the body of Sec. Lt. Lucien Herbert Higgs, R.F.C., who died in Northampton Hospital on June 9th from a fractured skull, evidence was given that he was 25, and was born at Brussels. He got away from Brussels on December, 1914, and was a dispatch rider in France for two years. In March last he was transferred to the R.F.C., receiving his commission on June 1st. It was Mr. Higgs's first flight alone.

The accident was attributed to a descent on sloping ground which accelerated the pace of the machine, and to long grass clogging the wheels and causing the aeroplane to overturn. A verdict of accidental death was returned.

HOEY.—Sec. Lieut. Frederick Cyril Hoey, R.F.C., aged 18 years, who was accidentally killed on June 7th while flying in England, was the elder son of Ida and Charles Hoey, of 16, Shrewsbury Road, Ballsbridge, County Dublin.

HUGHES.—Sec. Lt. Ronald Baskerville Hughes, R.F.C., who was killed while flying in England on May 31st, was the youngest son of the late Thomas Hughes and Mrs. Hughes, of Abbey House, Cobridge. He joined the Artists' Rifles last Feb. and shortly afterwards transferred to the R.F.C. Cadet School at Reading and was gazetted on April 20th. He was 18 years of age.

MOORE.—A verdict of accidental death was returned at an inquest on the South Coast on June 11th on the body of Capt. B. J. W. Moore, R.F.C., who was killed by a nose-dive of the aeroplane he was piloting on June 10th. Another officer who was undergoing instruction was seriously injured, but is expected to recover. Capt. Moore had served about a year in France, and held the Military Cross. He had come over for further experience as an instructor. The cause of the accident had not been ascertained, but it was understood that the engine was working properly.

OGDEN.—Lt. Percy Ogden, R.F.C., died at the Military Hospital, Shorncliffe, on June 8th, after a few days' illness. Mr. Ogden, who was in his 42nd year, was the son of the late Mr. Thomas Ogden, founder of Ogden's (Limited), which in 1902 became a branch of the Imperial Tobacco Company (of Great Britain and Ireland, Limited). He was a director of the latter company, and of late years he had undertaken charge of its manufacturing operations in this country.

PORTER.—At the inquest on the body of Sec. Lieut. Stanley Fitzherbert Porter, R.F.C., held at Rugby on June 9th, it was stated that on June 6th, during machine-gun instruction, near Rugby, to Flying Corps officers, Sec. Lieut. W. Watts placed by mistake a live cartridge in a Lewis gun and fired, fatally injuring Mr. Porter, who was sitting at a table facing the gun. The dummies were examined earlier in the morning and found correct, and it is presumed that possibly a live cartridge fell to the floor and was placed in a box of dummies by mistake. Half a dozen officers were present at the time, and another one was hit on the foot. A verdict of accidental death was returned.

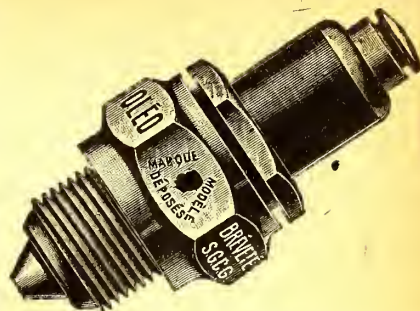
TAYLOR-LOBAN and ALGER.—While flying together in Scotland on June 7th, Capt. G. Taylor-Loban and Sec. Lt. G. C. Alger were killed as a result of their machine making a spinning nose-dive to earth. Mr. Alger was killed on the spot and Capt. Taylor-Loban died shortly after being admitted to hospital. Capt. Taylor-Loban has twice been at the front and was twice wounded.



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TENNANT.—Sec. Lt. H. Tennant, Dragoon Guards, attached R.F.C. (killed in action), was eldest son of Mr. H. J. Tennant, M.P., late Under Secretary for War, and of Mrs. Tennant. He was 19 years of age, and was qualified as a pilot and instructor. In June last year Mr. Tennant met with an accident while flying at Westerham, Kent, when his passenger, Captain George Alfred Grime Jones, the Buffs, was killed. Captain Jones had fought with his regiment in the battle of Loos. Mr. Tennant had his commission in the Cavalry in Nov., 1915, and was gazetted flying officer in Feb. of this year.

THOMSON.—Lt. Wardlaw I. Thomson, R.F.C., was making an ascent on the South Coast on June 6th, when something went wrong with his machine, which nose-dived. On assistance arriving it was found that the officer was dead.

TURNER.—An inquest was held on June 4th on the body of Sergt. William Charles Turner, R.F.C., aged 26, of Brecon, who was killed the previous day. Turner had been training as a pilot, and on June 3rd took an ordinary type machine for his first flight alone. All went well, and he had good command of the machine, but on descending he overshot the mark and went up into the air again. Getting to a height of about a thousand feet he appeared to lose his nerve in making another descent, and giving too much "left rudder" the aeroplane took an erratic downward course, finishing with a nose-dive. The force of the impact with the ground caused the petrol tank to burst, and Turner was badly burnt before he could be extricated. It was then found that he had sustained fracture of the skull and dislocation of the neck, and death had occurred before the petrol tank burst. A verdict of accidental death was returned.

[It has been necessary to hold over a number of other personal notices till next week.]

FRANCE.

OFFICIAL COMMUNIQUÉS.

JUNE 5th.—On June 5th our pilots fought numerous combats against enemy aviators. Seven German machines and a captive balloon was brought down. It is confirmed that another enemy machine was brought down on June 4th east of Filain (north-west of Braye-en-Laonnois).

JUNE 5th.—In reprisal for the bombardments by the enemy of the open town of Bar-le-Duc on May 29th and 30th, seven of our aeroplanes during the night of June 3rd-4th flew over the town of Treves, on which they dropped 1,000 kilogrammes (nearly a ton) of bombs. In the same night our squadrons copiously showered bombs on the enemy aviation grounds at Morhange (north-east of Nancy), Habsheim (east-south-east of Mülhausen), Frascati, and Sisson; 15,500 kilogrammes of bombs were dropped on the sheds, which suffered important damage.

Other squadrons bombarded the railway station of Lumes (Ardennes), the munition depots of Wagneriville (north of Reims), and the railway stations of depots in the region of Laon.

Among the operations effected during the night of June 4th-5th were the bombardments of the aerodrome of Colmar, of the station at Thionville (north of Metz), where a fire broke out, and of the station of Dun-sur-Meuse, where three explosions were observed.

During the day of June 4th our pilots brought down six German aeroplanes and forced seven others to land in a damaged condition in their own lines. It is confirmed that two other enemy machines were brought down, the first on May 25th and the other on June 2nd.

JUNE 7th.—Two enemy machines were brought down on June 6th. Further information received records the certain destruction of three more German machines which were brought down by our pilots on June 3rd, 4th, and 5th.

JUNE 8th.—On June 7th our aeroplanes copiously bombarded the stations at Avricourt and Reschicourt and various Army cantonments in the Vouziers region.

JUNE 10th.—In the period from June 1st to June 7th our aviators engaged in numerous air fights and brought down 21 enemy aeroplanes, whose fall was established, and two captive balloons, which fell in flames.

* * *

It was reported from Paris on June 6th that on June 3rd some seaplanes from the seaplane station at Havre saw a submerged submarine making its way towards a steamer, with the obvious intention of attacking it. They at once dropped some bombs, and afterwards the submarine was no longer seen.

GERMANY.

OFFICIAL COMMUNIQUÉS.

JUNE 5th.—In favourable weather conditions aerial activity was very lively throughout the day and night on the whole front. Yesterday 12 enemy aeroplanes were shot down in aerial battles and by our anti-aircraft guns. One captive balloon was brought down by artillery long range fire.

Lt. Voss brought down his 32nd, Lt. Schäfer his 30th, and Lt. Allmenröder his 24th opponent in aerial battles.

JUNE 6th.—On the eastern bank of the Struma (Bulgaria) English aviators dropped incendiary bombs on the ripening corn-fields.

JUNE 6th.—During numerous aerial battles along the front the enemy lost 11 aeroplanes. Lieut. Almenröder scored his 25th and 26th victories, and Lieut. Voss his 33rd victory.

One of our aeroplane squadrons dropped over 5,000 kilogrammes (nearly five tons) of bombs on the military establishments of Sheerness (mouth of the Thames). Good hits were observed.

AMSTERDAM, JUNE 7th.—A Crefeld telegram to the "Rheinisch-Westfälische Zeitung" announces that the aviator Lt. Schaefer has been killed in a fight with a British air squadron while leading his own squadron. Schaefer, who was 25 years old, had been decorated with the Order Pour le Mérite.

Lt. Schaefer was first officially mentioned in the German communiqué of April 9th, when he was reported as having brought down his 12th enemy machine on the Western front. His 30th victory was announced by Main Headquarters on June 6th.

JUNE 7th.—Yesterday (June 6th) eight English aeroplanes were shot down in aerial battles, one by Lieut. Voss, who thereby won his 34th aerial victory.

FRONT OF THE GERMAN CROWN PRINCE.—Effectively supported by our artillery, mine-throwers, and aviators. . . . companies, in spite of the stubborn resistance of the enemy, captured the objective which they were ordered to take.

JUNE 8th.—In many aerial engagements, principally on the Flanders front, 12 aeroplanes were brought down. Three enemy machines were shot down by anti-aircraft fire from the earth.

JUNE 10th.—On the day before yesterday (June 8th) in Flanders the enemy lost 10 aeroplanes, and yesterday he lost six in aerial battles and as a result of anti-aircraft fire. A few days ago Sgt.-Major Müller shot down his 14th opponent in aerial encounters.

RUSSIA.

OFFICIAL COMMUNIQUÉS.

JUNE 7th.—A number of our aeroplanes made a series of flights over the rear of the enemy and dropped bombs. One of our aeroplanes fell in the region of Tlumacz. The aviators, Stupoff, Vorozoff, and Lieut. Berkle perished.

JUNE 8th.—On June 1st our aviator Capt. Kruten, after a brief encounter, brought down a German aeroplane; enveloped in flames, the machine fell in the region of the village of Wymyslovka (west of Tarnopol). The aviator and the machine were burned. On June 6th the same Capt. Kruten, while returning from a reconnaissance, observed three German aeroplanes and, giving them pursuit, overtook the hindmost machine and brought it down with machine-gun fire. It fell on Moletagal, in our territory. The aviators were made prisoners.

JUNE 9th.—Our aviators Cavalry Captains Kazakoff and Argeieff brought down an enemy aeroplane which fell in flames. The occupants were taken prisoners.

AUSTRIA.

OFFICIAL COMMUNIQUÉS.

JUNE 5th.—Near Arco, in Southern Tirol, an Italian seaplane was shot down.

JUNE 5th.—Over Cortina d'Ampezzo an enemy biplane was shot down in an air fight.

JUNE 8th.—An enemy aviator, whose machine bore our marks, dropped bombs behind our front.

JUNE 9th.—On the afternoon of the 8th an enemy aeroplane reconnoitring our positions in Upper Val Furva (Western Trentino) was brought down on the Cedei glacier by machine-gun fire.

ITALY.

OFFICIAL COMMUNIQUÉS.

JUNE 6th.—Aerial activity was intense. One enemy machine was beaten down by gun-fire near Moos, Sexton Valley, and another during an air fight between the Vodice and Monte Santo.

Last night our bombing squadrons, in spite of the violent shelling of hostile anti-aircraft guns, dropped over two tons of high explosives on the station of San Pietro (a junction), on the Trieste-Lubiano (Laibach) railway. Our machines returned safely.

JUNE 7th.—Two of our bombing squadrons carried out important raids. One squadron, following the valley of the Adige River as far as its confluence with Noce River, successfully bombed military works near Mezolombardo, north of Trent, while the other renewed the destruction of the sidings of S. Pietro, on the Lubiano (Laibach) railway. All our machines returned.

JUNE 11th.—Our aircraft, notwithstanding the adverse atmospheric conditions, successfully bombed the enemy's back areas and heavy batteries in the upper valleys of the Astico and Assa. All our machines returned safely.

BELGIUM.

OFFICIAL COMMUNIQUÉS.

MAY 11th.—Our aeroplanes have bombarded the flying grounds of Haudzaenle.

MAY 12th.—A German aeroplane has been attacked by a Belgian chasing machine and fell in the forest of Houyhulst.

JUNE 6th.—Our aviators bombarded the railway stations at Vyswegan and Langemark.

MORE PROOF!

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A Further Three Years' Flying Experience.

BY CAPTAIN B. C. HUCKS, R.F.C.

On June 5th Captain B. C. Hucks, R.F.C., delivered to the Aeronautical Society a lecture entitled "Three More Years of Flying," the significance of which title he himself explained in his opening remarks.

Captain Hucks does not profess to be any kind of scientist, but he is certainly one of the ablest pilots in this country, which is to say in the world, as well as being one of the very earliest of British aviators, his certificate being No. 91 and dated May 30th, 1911. His lecture, therefore, was essentially that of a practical man who has very little to learn about any branch of flying, but who is not only willing but anxious to learn anything that other people can tell him which will help to enlarge his knowledge of aviation.

The chair was taken by Lieut.-Gen. Sir David Henderson, K.C.B., D.S.O., Director-General of Military Aeronautics, and in introducing the lecturer General Henderson described him as a master of his subject for the last six or seven years.

CAPTAIN HUCKS said:—

Ladies and Gentlemen,—I think perhaps the title of my paper requires a short explanation before beginning.

A little over three years ago I was honoured by being asked to read a paper on flying before this Society, which I then called, "Three Years' Flying Experience." I need hardly say that paper caused me no small amount of anxiety in preparing, even then, when a mere description of an ordinary flight would deeply interest most people, because when I came to get down to it I had to ask myself what there was I could find to talk about that would interest the learned and technical audience I knew I should have to face.

However, the paper was read, and I suppose it gave satisfaction, because a short time ago I found the Society, like Oliver Twist, "asking for more."

So as to give myself plenty of scope to-night I have called this paper, "A Further Three Years' Flying Experience," and certainly its preparation has caused me no less anxiety than on the first occasion.

The past three years, although normally a short space of time, yet measured by the advance of aviation, has been a veritable lifetime. Many thousands of people are now deeply engrossed in the subject. Most of you who have honoured me with your presence here to-night have studied flying from the very highly technical and scientific side; in fact, far too technical and scientific for me, and you certainly know a great deal more about the subject from that point of view than I do. It is to you, gentlemen, that I tender my apologies, and I think that when you received particulars of this evening's programme, some such notice as "laymen only need attend" should have been appended. I hope that this plain, non-technical account of things, hardly touching upon the war, connected with my flying which has been brought to my notice during these three years, may interest you a little, and, perhaps, form the basis of a discussion.

PROGRESS.

I think I am right in saying that through the war aviation has advanced more than it would have done in eight or ten years of peace conditions. In fact, the rate of improvement in aircraft is so fast, the pace so alarmingly rapid, that it is almost impossible for manufacturers to keep pace, for it seems that by the time the latest and most efficient type of machine is manufactured in sufficiently large numbers to gratify half the requirements of the Services that type is superseded and becomes out of date and obsolete.

That you may realise at a glance the remarkable strides that have been made over this period, I will show you some diagrams, which, without giving any figures that may be military secrets, should convey a fair idea how the capabilities of aircraft have improved. I have taken the average performances of five different types of Service machines used at the beginning of the war, and compared them with the average performances of five different types of late patterns now in use in France.

Captain Hucks then showed four interesting diagrams. The first diagram represented the growth in three years of the maximum speed capacity flying level, and showed that speed is now nearly double what it was at the beginning of the war. The second diagram consisted of two curves showing the increase in machines' capacity for climbing against time. The next diagram represented the growth of horse-power developed by aero-motor engines, and showed that horse-power has more than doubled. And, lastly, he showed the increase in the number of certified pilots during the past three years, which, of course, must not be indicated.

Continuing, Captain Hucks said that a pilot has only to take a short flight on a 1914 type machine and then fly the latest 1917 pattern as a comparison really to appreciate this colossal advance, and went on:—

Some little time ago I had occasion to again fly, after a con-

siderable lapse of time, a 50 h.p. Gnome Blériot, a one-time premier machine; in fact, a type used quite a lot by ourselves and the French at the very beginning of the war. At first, I believed the machine to be a very bad specimen of the species, but ultimately, after flying it for some time, and acquiring a sort of lost art of balance, like a skater who has not skated on ice for years, and has to get his legs again, I realised that it was quite a good specimen of the type, but that it takes quite a time to again get used to such inefficiency.

The advance seems to have been along, one might say, quite conventional lines, that is improvements on what might be accepted as standard designs, and no good results have been obtained from any departure from that standard. Perhaps the furthestmost departure from what I call standard, and that is very slight, has been the triplane. The results obtained with the quadruplane have not justified the experiment.

IMPROVEMENTS.

During the past three years the first marked improvement, to my mind, which asserted itself was the inherently stable machine, attained apparently by such slight detail alterations as sections of planes and elevators that it required an experienced eye to detect a stable or unstable aeroplane by casual inspection when standing together.

Then came the synchronised timing gun-gear which enabled the machine-guns to be fired through the propeller on tractor machines. This device is really so simple that one is at a loss to understand why it had remained so long undiscovered. It had the effect of giving the tractor type of machine a new lease of life; although a more efficient type aerodynamically than the pusher, it had been falling into disfavour as a fighter on account of the inability of the pilot to shoot straight ahead of the machine.

Improvements in engines, to my mind, are responsible for present-day performances to a far greater extent than improvements in machines, chiefly through sheer increase of horse-power, as my diagram shows. And cases have occurred where certain obsolete types have been made serviceable simply by fitting an improved type of engine.

The improvements in the machines themselves seem to have been limited to details, such as wing sections, attention to head resistance, soundness of construction, etc. The very efficient freak machine has yet to make its appearance.

I will not attempt to discuss the future of aviation, but setting aside the boundless commercial possibilities, I am more and more convinced that if we find it necessary to keep up an enormous navy, say a two-Power standard to protect our island, it will be essential to maintain at least the same standard in the air. That in itself guarantees a colossal future for aeronautics.

But to return to the subject of my paper to-night, I would like to place before you a few points as I have found them during a further three years of piloting.

DIFFERENCE IN MACHINES.

I have flown many different types of aeroplanes, and considering the extraordinary variations in the types the difference in the actual piloting of any modern machine, to my mind, is remarkably small. I am of the opinion that a pilot who is thoroughly efficient with any particular type will in a very short time be master of any.

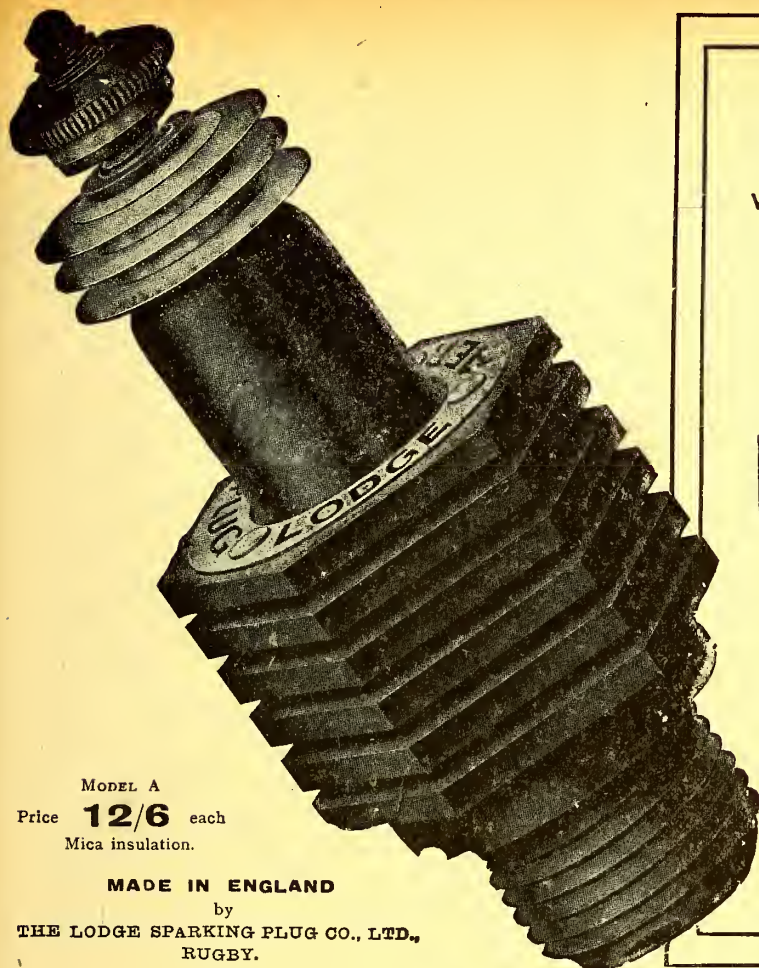
I find that on stepping out of a very fast small scout into a really big twin engine machine the difference in the manner of piloting is very slight compared with the vast difference in the machines. Precisely the same methods are employed, the same trouble and risks are to be avoided; the chief characteristics seem to be that the smaller and faster machines are more difficult to land but are easier to handle in the air.

In the case of "crashes," the larger and heavier the aeroplane the less damage there is likely to occur to the occupant as a tremendous amount of the impact is absorbed by the machine. Very much larger and heavier machines than those at present in use might be comfortably flown single-handed, no extra effort being required for the controls, provided the controlling surfaces are properly balanced.

To the lay mind it might appear that with such contrasts in the outward appearance of the smaller and larger machines, it would be necessary to train pilots specially and extensively for each type, but in my experience this is not so. I certainly think the best results are obtained when pilots are allowed to specialise. This, however, I understand, has many drawbacks on active service.

CRASHES.

Crashes are mainly due to three causes, viz., engine failure, faulty piloting, and faulty machines. Engine failure undoubtedly is responsible for most of the crashes, often because of the hopeless unsuitability of the landing ground at the pilot's dis-



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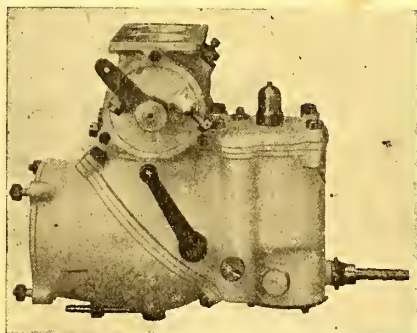
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posal. To many pilots engine failure is most disconcerting, and it is then they are called upon to use rather more judgment and skill, so that even with a fairly suitable landing ground available they very often crash. In my experience, embracing the testing of hundreds of new machines, it is seldom that a serious defect in the engine "lets one down"; it is nearly always due to a small detail.

I think I have had to make more forced landings through failure of the petrol supply than all the other troubles combined. This is due more often to failure of the pressure feed than to a choke in the supply pipes and very seldom to severed connections in the feed system.

Because of the absence of a float chamber to the carburettor in the rotary engine, even a variation of the petrol pressure is more serious than in the rigid stationary type. In the former case the amount of petrol that gets to the motor is controlled by the pressure and a fine adjustment. If the pressure increases unduly the motor chokes from over-richness of mixture; on the other hand, if the pressure drops away, the mixture is unduly weakened. This variation can be controlled by the fine adjustment to a large extent; but when that limit is exceeded the engine will fail.

Most of the trouble seems to be caused by failure of the pump, which in some cases forms an integral part of and is driven by the motor; in others it is a separate unit, driven by a small air-screw. These failures are usually through valves sticking up and pistons becoming dry. Other causes of failure are in the relief valve not being pressure tight or sticking down. At any rate, the present system of pressure feed, to my mind, is such a bugbear that it is high time something was substituted.

As far as the non-rotary motor is concerned, to my knowledge this matter is being tackled. I have been flying recently a machine fitted with a petrol pump in place of the air pressure pump, the petrol being pumped direct from the main tank to the carburettors and the surplus is returned to the tank through an adjustable spring-loaded relief valve, so that petrol is delivered at any desired pressure to the engine. So far it has proved most satisfactory, with this advantage, that a punctured tank does not put it out of action.

DIRT IN TANKS.

Dirt in the petrol tank accounts for quite a large proportion of engine failures in new machines. This form of trouble ought to be avoided. It is an important matter which manufacturers should be made to recognise and a very thorough system of tank washing employed before installation in the machines.

The dirt in the tank usually takes some time to work its way into and accumulate in the feed pipes or filters sufficiently to choke them. The machines are often by that time being delivered by air by pilots who are none too familiar with them, consequently engine failure means a good chance of crashing. I remember having four forced landings while delivering a new B.E.2C. from Farnborough to Dover solely on this account.

Another simple cause of engine failure which might easily be guarded against is that petrol cocks in many cases have no definite locking device to ensure that they remain in the open position during flight, consequently they are liable to vibrate into the "off" position, thus cutting off suddenly the petrol supply. Many instances have come to my notice where petrol cocks are fitted in such a manner that the tendency is, through the weight of the cock lever, to fall shut instead of the reverse.

This is such a simple and yet such an important point that it really is surprising mistakes like this are continually allowed to be made. I have had engines cut out suddenly on three occasions during the past two months from this cause alone; one meant a forced landing because the petrol cock was not accessible to the pilot, the other two were opened again in the air.

It often leads to serious results, as the petrol fails suddenly, and it is seldom that the cause is discovered before the forced landing is made. Having somewhat a limited time at my disposal this evening, I will not touch on what I have found to be other causes of engine failures, but I can assure you that, as far as my experience shows, they are a small proportion compared with those due to petrol supply, and improvements in this direction will reduce engine failures enormously.

Errors of judgment or faulty piloting account for nearly or perhaps as many crashes as engine failure. The most common error made even by experienced pilots is losing flying speed on a turn, which starts a side-slip, and, given sufficient height, terminates in a nose-dive or the more serious predicament, a spin.

This mistake is often made under the stress of circumstances when engine failure calls forth extra effort on the part of the pilot to reach a certain landing spot. The trouble is nearly always incurred by turning too flatly until the wing drops and the machine side-slips, generally in the effort to get into more suitable ground than that available straight ahead. This is always a dangerous manoeuvre, and in nine cases out of ten when smashes have resulted, probably less damage would have

been caused had the pilot kept his machine from turning and pancaked straight ahead.

I have found that most of the later type machines can be stalled (i.e., speed reduced well below flying speed) without any risk of side-slipping, provided they are kept in a straight course and laterally level, as they will automatically drop the nose as soon as the speed becomes so low that the elevators have little or no effect. Most of the serious accidents start at a height insufficient for the machine to get out of its side-slip before striking the ground. Others strike the ground at the later stage, usually a nose-dive, but in some cases a spin.

If sufficient height remains after the machine assumes a nose-dive, there is no reason why it should not be pulled out and a normal glide resumed, but in the other event, although it is possible to get out of a spin, it is far more difficult a proposition than the instinctive manoeuvre of pulling up out of a nose-dive.

SPINNING.

A spin is the extraordinary turning movement that some machines only too readily take up after being stalled on a turn or being turned too flatly even with plenty of flying speed. This is due to the machine suddenly meeting the air a great deal out of the parallel with its longitudinal axis, either through side-slipping, skidding, or yawing in the air.

Having had more than one involuntary spin, but having been fortunate enough to have sufficient height to get out again, I feel the matter is not to be treated too lightly. The position a machine assumes in a spin is a rapidly revolving side-slip or a fairly steep spiral dive, with this rather serious drawback, that the more one tries to pull it up by means of the elevator, the faster it spins.

No matter how high one is, if one persists in trying to pull it out in a normal way, it will remain out of control, because the elevator has now become the rudder, and instead of pulling it out, increases the speed of turning. If the controls are abandoned the machine will come out of its own accord, but personally I have always found the best and quickest remedy for spins is to straighten the rudder and shove the joy-stick forward; a clean nose-dive will then result, out of which the machine can be pulled.

I think, in the matter of spins, prevention is better than cure, and it is up to the designers to see that their machine is of the non-spinning type, as, however clever and quick the pilot may be in applying his pet remedy, he may not have height enough to do so, and the results are usually disastrous.

ERRORS IN LANDING.

The errors in judgment which are made in landing account for crashes galore, but these fortunately are usually a small matter compared to those mistakes made in the air, seldom resulting in more than a smashed landing chassis. Flying experience is the only remedy for this particular fault.

Landing with the wind will sometimes end in a crash through the machine over-running the limit of the landing ground; whilst landing side to wind will buckle wheels and wreck chassis. Neither of these troubles is always the direct fault of the pilot.

An easily distinguishable standard type wind-vane on every recognised landing ground would considerably lessen crashes from these causes.

CONSTRUCTIONAL FAILURE.

Accidents directly due to faulty construction of the aeroplane are fortunately comparatively rare, as when they happen the results are so often fatal. They occur, however, even on standard types.

In some cases the aeroplane is not entirely at fault, as in these days of heavy high-speed efficient machines with so little head resistance and which attain colossal speeds on diving, it is such an easy matter for the pilot to increase the load beyond the highest factors of safety. One has only to consider the load on the wings of a machine dived at 160 m.p.h. when it is pulled out with a heavy hand.

Constructional failures of machines in the air can sometimes be traced to damage inflicted by imperfect landings, usually to the back part of the fuselage in the region of the tail skid. This gets overlooked, and consequently the tail gives way under any extra stress whilst flying.

I should like here to be permitted to make a suggestion for the consideration of our Chairman for what it is worth, i.e., that a detailed record be kept of every engine failure, forced landing, or accident of every kind and description that happens, at any rate, at all home stations. These records to be collected and classified, so that valuable data may always be available. However, some such system as this may already be in operation.

TRAINING OF PILOTS.

I now come to a few points which might be brought forward from my experience with instruction of pilots. I think that a great deal of time and expense might be saved if some form of medical test were applied to prospective pilots, such as I understand is done in France, where the effect of sudden shocks upon the system of the candidate is recorded by mechanical means, and other tests are made which are supposed to give a

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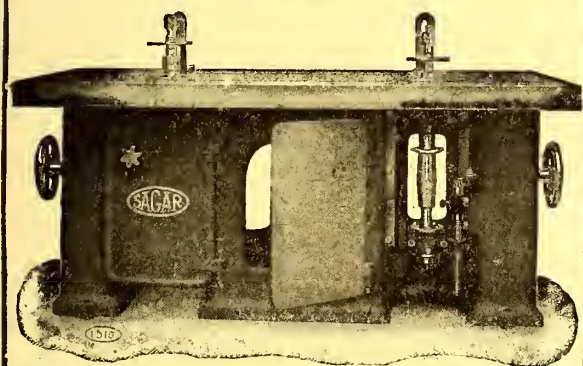
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fair indication at once of the medical fitness and the possession of the necessary qualities, such as nerve, judgment, and the presence of mind required for the making of a pilot.

There are many pupils, on whom a lot of time and material has been wasted in the endeavour to make pilots of them, who simply do not possess these ordinary qualities, and it is not until they have had smash after smash that it is discovered they simply have not got it in them. Now the French method should weed out the non-suitable candidate beforehand.

QUALIFICATIONS.

Personally I consider that the nearest equivalent to the art of flying is that of motor-car driving; a person who thoroughly understands and who can drive a car really well should possess the qualities required for piloting an aeroplane. General Brancker, in the paper he read a short time ago before the Society, mentioned a good horseman as the type possessing the necessary qualifications. I agree that good hands, a good head, steady nerves and judgment are essential qualities all of which should be found in a good motorist, with this advantage, that the good motorist is more likely to be naturally mechanical, a faculty inborn and not easily acquired, and so important in the matter of flying.

PENGUINS.

Time and material would be saved, in my opinion, if the modified "penguin" type of machine were more generally used for the very earliest training. I refer to the small-powered machine, incapable of leaving the ground, but designed solely for taxiing about the aerodrome, which was generally in vogue at the Blériot Schools before the war. On this machine the pupil can be loosed off alone immediately after preliminary explanation with comparatively no risk, and at the same time he would get used to controlling his engine, have plenty of practice in the use of that important control, the rudder, and lastly, but not least, he would have to be left to his own resources, use a little initiative, and get used to the noise and wind from his motor.

This type of machine might be modified in such a way that the other controls might be brought to play an active part in piloting the "penguin" over the ground. The whole fuselage and wings might be supported independently of the landing chassis (or rather the rolling chassis) in a sort of gimbals, so that it could be banked and elevated by the control lever whilst running along or turning. I think an hour's taxiing on a machine of this type would, as a preliminary, be of more assistance than the same amount of dual control, as the pupil would know at least more about the use of his rudder.

BENEFITS OF EXPERIENCE.

The best type of aeroplane to use for instruction in actual flying and the question as to whether it should be stable or not is a very debatable point. I do think, however, that the less efficient within certain limits the early training machine is, the better and sounder will be the elementary knowledge and experience gained by the pupil. Such experience is likely to be very valuable when, later in his career, he is confronted with engine failures or similar predicaments, where his reserve of engine power will no longer cover up his multitude of sins in piloting.

To illustrate this point, let us assume that there are two pilots, A and B. A has qualified for his Aero Club Certificate on a box-kite, i.e., early Henry Farman type biplane, fitted with 50-h.p. Gnome. B gets his certificate on a much more powerful machine, one that can climb quicker, and can even be turned and climbed a bit at the same time. He knows this is so because he has done it on his last eight. But A finds that to get round really comfortably on his he feels compelled to drop the nose a little, as it feels a little sloppy otherwise. At a later date, on valuable service machines, both A and B have engine failures. A lands successfully, B crashes badly through turning too flatly. A has learnt from the beginning that he was always on the safe side in dropping her nose a bit on a turn; B always thought it unnecessary.

STABLE TRAINING MACHINES.

Personally I do not think that the stable machine is the best for training. If it is considered so on the score that once in the air it will look after itself and so reduce the chances of the pupil crashing, then we have only to assume for the sake of argument that a self-starting training machine has been devised that will automatically land itself correctly, do away with the smashes on landing, and ultimately, with a few more improvements, all the pupil need do would be just to sit still and take the air, everything would be done for him, but after many hours of joy-riding on this super-school machine he would have learnt very little about piloting. For securing Aero Club Certificates for pupils at so much a head as a commercial proposition, this sort of machine might be excellent, but the unstable machine should be used as the basis of training to get the best results in the end.

INSTRUMENTS AND SENSATION.

I now come to another question, over which there is a deal of controversy. It is the use of instruments for training. I

consider instruments as valuable accessories to any machine, but only under certain circumstances are they necessities, and in training they should not be regarded as indispensable. It is the wrong system, in my opinion, for the pupil to be made to rely on them too much.

Although flying is largely a mechanical procedure, there is a tremendous lot of the personal sensation and feel that the pilot should acquire which, when once acquired, will take the place of practically any instrument devised. For instance, could an ice-skater learn to do the outside-edge merely by looking at a bubble of a spirit-level fixed in front of him? I should say no, but once he had acquired the feeling that he had correct balance, which only practice will give, he will make his sharp turn on the outside-edge at the correct angle better than any instrument could show him. Therefore, I say let the pupil acquire without delay that naturally instinctive feeling so absolutely essential for a good pilot. Whilst he is taught to rely on his instrument too much to climb, turn, or even try and land, he will be long, if ever, in acquiring the art that will make him independent of instruments.

CLOUD FLYING.

Personally, I seldom use an instrument as an assistance to piloting. Do not assume that I am sneering at instruments; in fact, as I have stated, there are times when they are a necessity. In fact, I am going to suggest that one instrument be fitted as a standard equipment, an instrument to reduce the risks connected with flying in clouds. It may not generally be known that there have been such a large number of fatal accidents during the last three years entirely due to flying through clouds, and I consider this subject wants going into pretty carefully.

The accidents to which I refer have not been questions of a want of height; the machines have become hopelessly out of control. I will give you an instance which happened to myself a few weeks ago in the West of England. You will then realise why I consider this is a serious matter, requiring particular attention.

A PERSONAL EXPERIENCE.

I set out on a very cloudy, windy day to do a test climb to 10,000 ft. on a late type two-seater. I had so often on previous occasions succeeded quite comfortably in reaching this height in spite of cloudy, overcast days by pushing up through the clouds, usually only a matter of a few minutes, into bright sunlight and the bluest of skies, and, after reaching the desired height, coming down again through the clouds, having flown by compass and time.

On this particular day, however, the wind was very gusty, and on reaching 1,200 ft. we got into dense rain cloud, but carried on to beyond 5,000 ft., still in the cloud, when the compass apparently began to swing (really it's the machine that begins swinging, not the compass). Efforts to check the compass had the effect of causing it to swing more violently in the other direction.

The air speed then rushed up far beyond normal flying speed; all efforts to pull her up checked her only slightly; then the rudder was tried, back went the air speed to zero; there was an unusual uncanny feeling of being detached from the machine, and I knew her to be literally tumbling about in the clouds. All efforts to settle down again to a straight flight seemed to be unavailing, until we emerged from the cloud very nearly upside down. Assuming control again was then an easy matter.

GETTING THE WIND UP.

This sort of thing has happened to me more than once, and, in the Flying Corps vernacular, "it puts the wind up you." And it has happened many times with other pilots. In some cases they emerge from the clouds in a spin, others are known in which the planes have collapsed under the strain of the sudden pull-up from the vertical nose-dive.

A few days ago, a squadron commander told me that on one occasion when in France everything loose in his machine fell out whilst in a cloud. A week or so ago, on the South Coast, a machine disintegrated in a cloud and the main planes landed half a mile from the fuselage. From my own experience, this is a very unpleasant state of affairs, and in consequence I avoid clouds when possible.

CAUSES.

Let us try and examine the cause of this. First of all you must realise that in a cloud you see nothing whatever but your machine around you. There is no fixed point visible. The only means by which you can tell if you are flying in a straight course is by your compass and your air speed. The compass should give you your direction horizontally, your air speed your direction vertically.

The first thing that happens, and very readily too, if windy and bumpy is that your compass card will begin to move slightly. It really appears to you that the compass was suddenly affected by the cloud, and you are still flying straight ahead. How often you hear a pilot say that as soon as he got into a cloud his compass started spinning. The moment the compass starts



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moving it requires extremely delicate ruddering to get it back to a steady position; in fact, one invariably over-corrects the compass movement, and so the trouble begins.

Once the compass starts on a good swing I have found it nearly an impossibility to get it steady again until out of the cloud. Before your compass starts to move, your machine has already started to turn. You rudder the opposite way to check it, over-correct it, and turn sharper the other way on to a banked turn; then the nose drops and speed goes up. Pulling back your elevator-lever has little or no effect, for if you are banked above an angle of 45 degrees the elevator becomes the rudder. All this occurs without the pilot being in the least bit aware of the position that his machine is taking relative to the ground. The instruments available are of little service once he loses his control.

A CHANCE FOR MR. SPERRY.

Of what use is his air speed indicator to him indicating 150-m.p.h. if the machine is on a spinning spiral, and he imagines that he is merely descending too fast on a steep, straight glide? He naturally tries to pull up, but with no effect. The bubble does not help him, as centrifugal force will send that anywhere.

It may be argued that if a stable machine is left alone under these circumstances it will right itself eventually and assume a normal glide. It very likely would if the pilot could steel himself to let it entirely alone, but before it did so it would have to be left to do a sheer vertical nose-dive for some moments, and in these days of big weights and little head resistance one is liable to attempt to pull out too suddenly from the dangerous high rate of speed attained on this dive. What I want to see fitted is an instrument which will show a constant vertical or horizontal line and be independent of centrifugal force.

I have no ideas upon the subject nor suggestions as to how this is to be brought about, unless something in the nature of a small gyroscope driven by an air-screw could be employed in some way to meet the requirements of flying in clouds, but until something is provided so that the pilot can see a fixed line, I think we shall continue to have accidents from this cause.

HIGH FLYING.

There are lots of other points that I should like to touch upon, but as my time is getting short, I shall now deal with the subject of flying at great altitudes as I have found it. The most marked development in the modern machine is its extraordinary capacity for climbing to a great height in a short time.

At the beginning of the war the average height flown on active service was 4,000-5,000 ft., simply because few of the machines then in use with the impedimenta carried could get much higher. To-day a height of 20,000 ft. is, I believe, on certain occasions reached, and it is fairly certain that if progress continues at its present rate, heights a great deal beyond this figure will be reached as a usual thing.

These great altitudes bring forward many difficulties which will have to be seriously considered. The first trouble in the winter will be the extreme cold to which the occupants will be subjected unless they are protected by special cowlings which will gather in the warmth given off from the engine. This, to a certain extent, is the natural advantage obtained in the tractor.

THE VALUE OF PERSONAL COMFORT.

The question of the difference in the comfort of machines in this respect was shown to me in a very marked manner last winter. I was testing the fall-off of engine power at a height on a tractor two-seater in which it was specially arranged that the warm air from the radiator and engine passed along the fuselage to the pilot, and then to the passenger, and although at a height of over 21,000 ft. with the thermometer below freezing at ground level, I did not suffer in the least from the cold, neither did my passenger, who sat behind, complain, until we shut off to descend.

As a contrast to this, a few days later, I was on a single-seater scout at an altitude of 17,000 ft., and although it was a tractor with a rotary motor, I suffered intensely from the cold, and became so numb that my vitality must have been something akin to a dormouse under the snow, and, in spite of being well gloved, I had frost-bitten finger tips, which pained for many days afterwards.

Surely this is a very inefficient state for a pilot at the front to have to take on an air fight or other exacting work? Put two pilots up to a great altitude, one kept well warmed and comfortable, the other half dead with the cold, and it would be easy to surmise which would be most likely to do the best work.

I really believe it is more by accident than design that the pilot or passenger have berthed at all in the past from the heat of the engine, with the exception, perhaps, of the late S. F. Cody's machine. He purposely placed the radiator of his pusher in front of the pilot to keep him warm. I know from my experience when flying in France in the cold weather that the discomfort owing to the extreme cold became intense when flying only at 6,000 ft. on a two or three hours' reconnaissance flight.

This is a point to which designers should give attention, especially as machines are now easily capable of reaching great heights. During summer weather, conditions would probably be

tolerably comfortable, but in winter it would be well nigh impossible unless better arrangements are generally made.

During a recent heat-wave even, I have experienced cold of 20 degrees below freezing point at 20,000 ft.

EFFECTS ON THE MOTOR.

Cold also affects the motor pretty seriously. This is more noticeable with the water-cooled type. Unless some provision is made for blanketing the radiator surface at heights, it becomes far too cold for efficient running. Cases are known of the freezing of the water system on a descent from a great height, with pretty serious results to the motor, as well as the difficulty of getting the engine to run again efficiently through being too cold to effect a landing. In the future war machine the pilot must have a very wide range of control over the water-cooling system.

EFFECTS ON THE PILOT.

I will now touch lightly on effects that I have experienced on high flights. I have found the effect of high, i.e., rarified, air to be felt slightly at about 10,000 ft. increasing with the altitude. Breathing becomes affected, respiration shorter and quicker, there is a curious oppressive sensation and a bulging feeling in the head until the height of about 20,000 ft. is reached.

I am told by a medical friend who has made rather a study of the subject that there is always a risk of a sudden collapse, and oxygen should be used whether the aviator feels fit or not. Of course, the effect felt varies considerably with individuals, and with the state of one's health.

About 18 months ago I suffered slightly with my heart, and found I could not get very high without feeling giddy, and after returning from a flight to 12,000 ft. I had palpitation, which lasted until the following day. In consequence, I had to abandon high flying until treatment got me fit again. This year I have made a number of high flights, and have felt no ill effects whatsoever; in fact, I find the more one gets accustomed to going up high the less the effects are felt. I am told that this also is the case in mountaineering.

I can remember the unpleasantness of my first flight to 15,000 ft. It was very marked, especially the pain experienced in the drum of the ears on descending. The fact that a flight now to 21,000 or 22,000 ft. does not have so much effect, I put down entirely to acclimatisation.

USE OF OXYGEN.

I use oxygen as a precaution when ascending beyond 20,000 ft., for the previously mentioned reason. A small bottle is carried, fitted with a special reducing valve, which is fixed in the fuselage within easy reach of the hand. No special regulation is required, as it is set to pass only the necessary amount of gas into the face mask which acts as a mixing chamber, with its inlet and outlet air valve.

The apparatus weighs 16 lbs., and contains sufficient oxygen for one hour's continuous use. After reaching 20,000 ft., I find it is only necessary to use the oxygen intermittently, and, accordingly, I simply hold the mask, after turning on the gas, over the mouth and nose, and take a few breaths of it, perhaps every half minute.

The effect to me is remarkable; most of the oppressive feeling vanishes, and, excepting for the unpleasant bulging feeling of the head, which you experience with a bad cold, the sensation is one of suddenly being again at ground level. The only after-effects upon landing from these high altitudes are that you seem to acquire a pretty good thirst, not a very serious hardship to many, due, I suppose, to the use of oxygen.

If the speed of climb continues to improve at the rate it has for the past three years, it looks as though aviators will become subject to what is known as "Cassoon (Caisson) Disease," due, I am told, to the sudden reduction in atmospheric pressure, such as divers are subjected to when they come to the surface from a great depth, owing to the nitrogen which has been absorbed by the system, in proportion to the atmospheric density, forcing itself too rapidly at any lower pressure from the system.

There are many other points that I intended touching on in this paper, but I find that to do full justice to the subject it would occupy considerably more than the limited time at my disposal this evening if there is to be any discussion.

THE DISCUSSION.

When General Henderson asked for volunteers to discuss the lecture, considerable reluctance was shown, despite the presence of a large number of military aviators, and one imagines that if the General had called for volunteers to undertake a night bombing raid on B.E.2Cs. with 90 R.A.Fs., he would have received a much readier response, for a young man needs a vast amount of moral courage to get on his hind legs and talk about flying under the critical eye of one who to him represents omnipotence.

However, the discussion was eventually excellently started by WING-COMMANDER LONGMORE, R.N., who said that nobody was more capable of talking of flying than was Captain Hucks, and he cordially agreed with most of what the lecturer had said. On the question of instruments, however, he disagreed, because it was found that flying over the sea was much like flying in clouds. The sea and sky merge into one, and young pilots, having

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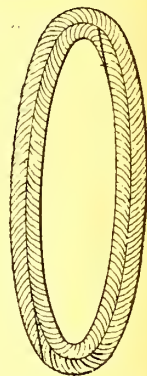
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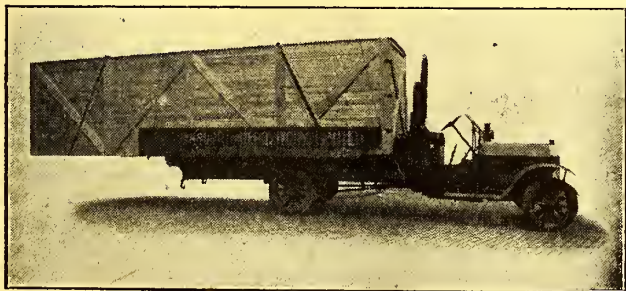
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no fixed point at which to look, find great difficulty in keeping a course. Consequently they have to rely entirely on their instruments. He therefore thinks that pupils should be taught to fly by their instruments with their heads inside a box. For this reason instruments must be made good enough for the purpose, and he agrees with Captain Hucks' demand for an instrument that will give an absolute horizontal or vertical line.

THAT PIECE OF STRING.

He was surprised that the old pioneers' dodge of using a piece of string as a side-slip indicator is not more used. He related how, when a few days ago Wing-Commander Featherstone Briggs, R.N., who had recently returned from Germany after two and a half years' imprisonment, was going for his first flight on a modern machine, he immediately went to look for a piece of string, which he tied up in front of him in the way he had been accustomed to do before the war, and, in spite of not having been on an aeroplane for two and a half years, he proceeded to fly perfectly.

One entirely agrees with Commander Longmore on all these points, especially on the piece of string, and it is quite astounding that modern instructors do not advocate its use by their pupils. There are undoubtedly times when the said piece of string will indicate when a machine is getting out of hand better than anything else.

It is true that if a machine is following a steep spiral path in a cloud the string will then stream out in its proper horizontal position in front of the pilot, but in that case the speed indicator will show that the machine is exceeding its proper speed. If the pilot in endeavouring to check that speed makes any movement which throws the machine off its proper course in relation to the air, the string will immediately be deflected and indicate in which direction he is going wrong.

It was, one believes, some time before the war that a correspondent of this paper wrote describing an actual wind-vane which should be fixed on the front of the machine as the ancient piece of string used to be fitted and which would indicate on a dial on the dashboard precisely in what direction the machine was going wrong. If these lines happen to meet the eye of the inventor of that simple mechanism, perhaps he will be good enough to communicate with the present writer.

PENGUINS.

As regards penguins, COMMANDER LONGMORE is of the opinion that under modern conditions of intensive culture of pilots, about

150 pilots careering about over half a square mile of aerodrome, the penguins suggest a number of collisions.

As regards the French medical tests for resistance to variations of pressure and shock, he said that he thinks that such tests might turn down many men of nervous temperament who would prove excellent pilots, the mere prospect of undergoing these tests being sufficient to affect their heart action even more than the act of flying. On the other hand, the bullock-natured boy who would never make a good pilot would probably stand the test quite well.

He endorsed the lecturer's opinion that the warmth from the water-cooled engines should be used for the comfort of the pilot in high flying, and remarked that it made one wonder how long we should continue to use rotary engines under present conditions.

CUTTING-OUT ENGINES.

LIEUT.-COLONEL W. D. BEATTY, R.E., R.F.C., in a charming but too brief speech, said that he disagreed with the lecturer on the subject of the reliability of engines. He said that he thinks that in fact modern engines are too reliable for training machines, and that it would conduce to the better education of pupils if it were arranged that their petrol taps should jar shut at irregular intervals so as to give them practice while learning in the art of knowing what to do in the case of emergency.

Though Colonel Beatty made the suggestion half in jest, it is, in fact, a thoroughly sound idea and is actually a development of a trick the old instructors used to play on their pupils, and may very possibly be played on new pilots by present instructors—in that case on a dual control machine. In the old days when the instructor could reach for the control he simply turned off the petrol to see what the pupil would do when he found his engine stopping. Under the ancient method, if the pupil did not immediately put the nose of the machine down, the system of education varied between the instructor reaching gently for the control lever and pushing it forward, and hitting the pilot violently on the head and howling, "Down, you damn fool," in his ear.

Apropos which one recalls a certain instructor who always stoutly maintained that the best form of dual control he knew was a good heavy spanner, as he could always put both a pupil and his control out of action with it.

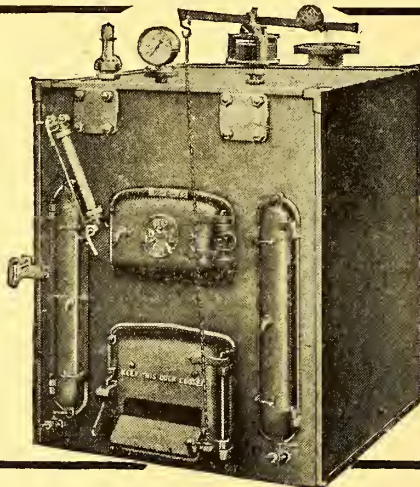
COLONEL BEATTY also disagreed with the lecturer on the subject of spinning, because, as he said, a spinning descent is an excellent

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way of getting down vertically without permitting the machine to acquire a dangerously high diving speed. The point is a good one, but, as Captain Hucks remarked in his reply, there is a vast difference between an aeroplane which spins unintentionally and uncontrollably and an aeroplane which can be made to spin when the pilot so wishes and can be stopped instantly. One gathers, for instance, that there is a good deal of difference between a spin on an R.E.8, when once it starts, and a spin on a Spad.

TYPES OF PILOTS.

MR. HARRY KNOX, a director of the A.B.C. Engine Company, disagreed with the lecturer on the question of motorists making good aviators, and recalled that, though in the early days it was thought that the crack motor racing drivers would make the best aeroplane pilots, practically every one of them had been a failure. He suggested, however, that there is one class of man who has never failed to be a good flier and that is the yachtsman. The reason being that, like aviators, yachtsmen have no absolute control over their vehicles and have to judge their distance and speed accurately to avoid accidents.

One quite endorses Mr. Knox's remarks and suggests that the reason why the man who is merely a motorist so seldom makes a first-class pilot is that, although his judgment of speed and distance is good, he really only controls his machine in two dimensions, and, even so, always has very definite controls. He never has to judge height, nor has he to calculate how long his machine will take to lose its speed of its own accord, and, therefore, he seldom has to study the art of killing distance as has the yachtsman and aviator. Also, many fast motor drivers, although they possess excellent eyes, have no hands whatever, which is precisely the quality in which first-class horsemen and yachtsmen excel.

MR. KNOX further related how Mr. Hawker, the famous Sopwith pilot, recently lost himself in a cloud and deliberately put his machine in a spin to avoid excessive diving speed.

MR. DREXEL REDIVIVUS.

As regards the French medical tests for pilots, Mr. Knox said that he had recently heard from Mr. Armstrong Drexel, who is in France, that this test for pilots, although still used, is not now regarded as an absolute test, but merely as an accessory. Incidentally, Mr. Knox imparted the interesting information that Mr. Drexel, who will be remembered as one of the earliest aviators in this country, has recently passed the full fighting course for aviators in the French Service—there being, it appears, three separate courses, the reconnaissance course, the bombing course,

and the fighting course, the last of which is reserved for the most skilful pilots.

An R.F.C. officer, wearing the Military Cross, whose name was not given, said that when flying in clouds he had found an air-damped compass more useful than one damped by spirits.

INQUIRIES.

MR. TAYLOR, of Waring and Gillows, inquired what Captain Hucks considered to be the average life of a regular pilot. He recalled that at the last lecture Mr. Holt Thomas had spoken of long journeys by air without mentioning how long he considered pilots would last at such work. Mr. Taylor also asked Captain Hucks for his opinion concerning the relative fatigue of flying pre-war aeroplanes and present machines.

A certain unnamed technical Member of the Aeronautical Society, of scriptural aspect, remarked how much as a technical man he appreciated Captain Hucks' lecture, and said that technical men in the industry would like to know very much more from practical men like Captain Hucks. For example, they would like to know how much pull a pilot actually puts on the lever of an aeroplane in looping, also what happens if the engine stops low down in a loop, and what is the difference between a spiral dive and a spin. He suggested that a record should be kept of the most minute details of all accidents which occur, at any rate at home, and said that if these details were tabulated they would be of great value to designers. He remarked that he had recently seen an aeroplane near Twickenham rotating round its longitudinal axis, and he would like to know how it was done.

CAPTAIN HUCKS REPLIES.

CAPTAIN HUCKS, in replying, dealt first with Commander Longmore, and suggested that it would be very much better to have collision between penguins on the ground than between pupils in the air; and he remarked on the curious magnetic attraction which one machine in the air has for the pilot of any other until he becomes an experienced flier. He remarked that anybody who has learnt to ride a bicycle will recall that lamp-posts have a very similar magnetic influence.

As regards spinning, he very much doubted whether an aeroplane in a voluntary spin performed the same evolutions as it does in an involuntary spin. He suggested that a voluntary spin was rather a species of a spiral dive. He agreed that the qualifications of a yachtsman are valuable, but said that the man who drives his car with proper feeling for his engine is more likely to make a satisfactory pilot, and that the mechanical knowledge of

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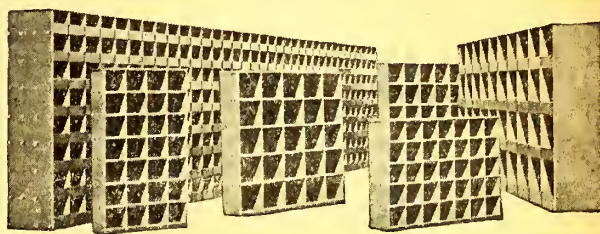
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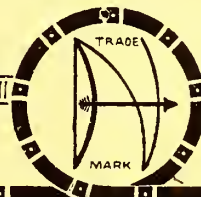
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the motorist was of great value to the aviator. He did not claim that the crack racing driver made a crack pilot, but he did claim that all experienced motorists have made good, useful average pilots. The man he wanted to eliminate was the chronic machine-smasher.

As regards French medical tests he did not advocate that they should be used to throw out those who do not pass them satisfactorily, but he said that they should be counted against the man so that after a period of probation if he were not satisfactory that would be the deciding factor, helping to explain why he would never be likely to make a good pilot.

As regards air-damped compasses, he said that any compass would be discounted in its accuracy by the effect of bad bumps in the air.

Describing the active life of a pilot, he said that it depends on the nature of his flying. Any man who puts in six months of flying on active service will probably need a very long rest, but that a pilot flying at home on modern machines, and using reasonable precautions, ought to be able to fly for ten or fifteen years.

On the subject of looping, he said that a certain diving speed is required to get over the loop, and this depends on the reserve power of the machine. A military machine will loop its normal flying speed, whereas the old 50 Blériot needs a dive of a couple of hundred feet to get up the necessary speed.

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He said that it is common knowledge that Service machines have been broken by being looped too suddenly, and he believed that it is possible to break any machine in the air by treating it too roughly. It is the same thing with cars, because if one takes a fast car too sharply round a corner, one either breaks the wheels or bursts the tyres, or turns the car over.

It might be quite possible to make a machine unbreakable by increasing the factor of safety, but, then, it would be too heavy for active service. If the engine stops at the beginning of a loop when one has no extra diving speed on, one may stop on the upward part of the loop and do a tail-slide. He himself, on one occasion, had tail-slid his aeroplane till the propeller had actually run the wrong way round.

As regards the effects of great heights on engines, the best engine he had yet come across only dropped 10 revs. per minute at 15,000 ft., but he imagined that at such a height as 20,000 ft. most engines of 250 h.p. would probably come down to about 90.

GENERAL HENDERSON'S REMARKS.

GENERAL HENDERSON, in proposing a vote of thanks to the lecturer, said that Captain Hucks had handled a great number of subjects. Some of the points were still undecided, and, on some other points, perhaps he had more information even than had Captain Hucks. He endorsed the point made by Captain Hucks that advance in design is so rapid that the best designs become second class and third class before they can be reproduced in quantities. It is impossible to get out of this difficulty, and there is no solution to it whatever.

While agreeing absolutely with General Henderson on this point, one might suggest, however, that very much time can be saved by improving the organisation between the production of the best design and the reproduction of it in quantities. For example, there must be at the present moment a number of firms just starting to reproduce types of machines which are new to them, although improved types of the same machines are already in existence. In which case it would be better policy to wash out altogether the type on which they are just about to start and get them going on the newer type which has just been designed. Rapidity of decision on the part of the officials concerned in a matter of this sort is of precisely the same value as is rapidity of decision on the part of a General in moving troops in the field.

On the subject of accidents GENERAL HENDERSON said that so far as records go, the majority of accidents are due to a combination of engine failure and faulty piloting, and by faulty piloting he did not mean to reflect on the ability of the pilots,

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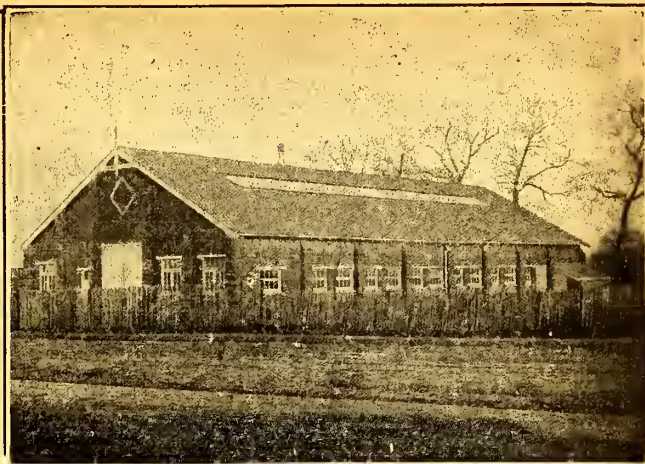
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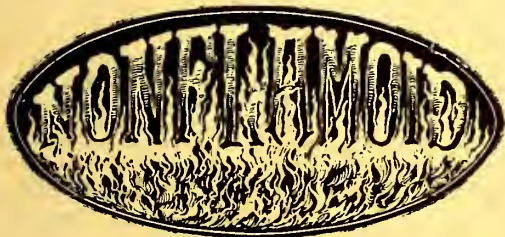
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as the faults were errors in judgment due no doubt to inexperience.

Faulty aeroplanes as such are very rare in these days, but there is no war machine of to-day which a pilot cannot break, and they can be broken without the pilot necessarily being a Hercules. All aeroplanes have a terminal velocity which they reach in diving with the engine on. If the engine is switched off when the machine is diving, it reaches a speed at which the head resistance of the machine equals the force of gravity, and the terminal velocity comes when the resistance of the machine equals the force of gravity plus the added speed given by the engine. An aeroplane should not break at this speed, barring faults in material and construction, but the danger comes in pulling it out of such a speed. Such faults in material and construction are very rare, for manufacturers have consciences and also have to encounter very stiff inspection.

It may be well to point out here as a supplement to General Henderson's remarks that one of the greatest dangers of breakage in high speed machines is due to the inherent longitudinal stability of some machines. That is to say, a pilot diving a machine for all it is worth may keep the control lever pressed full forward so as to keep the machine vertically on its nose, and on reaching the maximum speed obtainable he may let the lever go too suddenly without himself pulling it back at all, in which case the stability of the machine comes into play and it may flatten out suddenly from the dive of its own accord and pull its wings off. This, one believes, has actually happened, and the writer has also heard of machines which have been badly strained from this cause without falling to pieces in the air.

Referring to the French medical tests, General Henderson was of the opinion that they are quite wrong, and said that he had sufficient proof that quite small ailments such as affections of the nose and throat have more effect on a pilot's ability to fly at great altitudes than have his nerves. The man like an ox, to whom Commander Longmore referred, is certainly the last person wanted as a pilot.

He said that in this country we have developed physical tests which are much more important than any nerve tests, and it has been found that many pilots who had become utterly unfit for flying at the front, and whose companions said they were suffering from "cold feet," had been proved by our medical people to be suffering from pure physical disability, which was not nerves at all. He feared that we have lost in the past many good pilots because these facts were not known earlier.

As to the type of man who makes a good pilot, he said, there is no reason why horsemen and motorists should not both be good pilots, but he is of the opinion that the horseman is preferable as he has to watch his mount more constantly than a motorist, because the horse has a mind of its own and moves more quickly than a car.

On this point one disagrees entirely with General Henderson, because a horse, having a mind of its own, can generally be left to its own intelligence, which is a fairly useful guarantee that it will not break its own neck or its rider's if the rider has the sense to leave it alone, whereas a motorist has to be constantly on the watch. One of the most sensible remarks ever made in the early days of motoring was made by a journalist, who said he trembled to think of the increase of accidents in the traffic of London when the rational horse was replaced by a mechanical vehicle under the control of a human being of defective instincts. The underlying idea really has something to recommend it.

Personally, the writer has always held that the chief reason why a horseman makes a better flier than anybody else is that his hands are very much finer than those of the controller of any other vehicle owing to the sensitiveness of his mount. Furthermore he is the only person who is accustomed to control his mount in the third dimension.

MAJOR-GENERAL RUCK, in thanking General Henderson for presiding at the meeting, congratulated him on the efficiency, bravery and devotion of the men under his command.—C. G. G.



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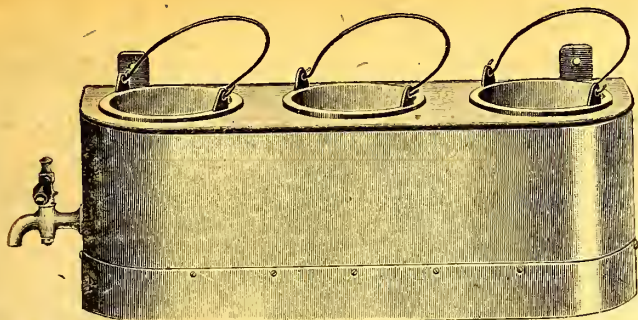
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WEDNESDAY, JUNE 20, 1917

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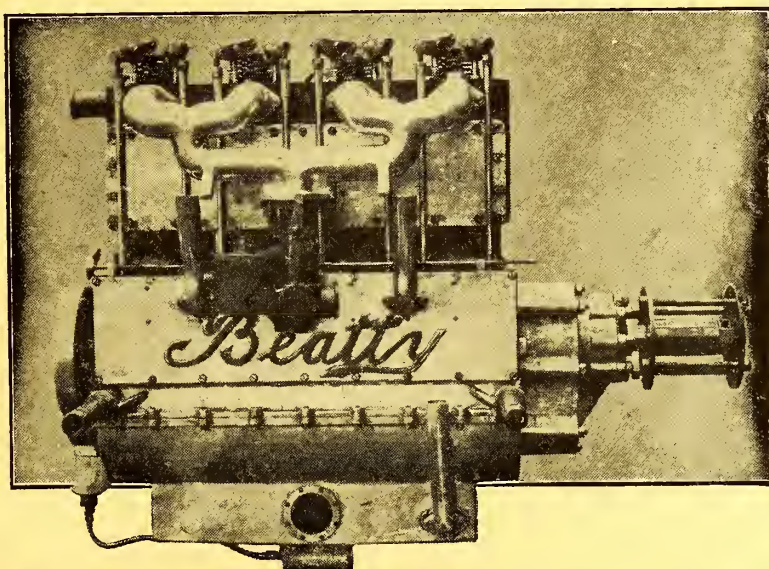
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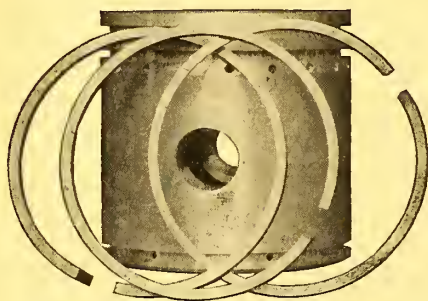
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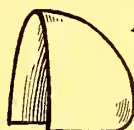
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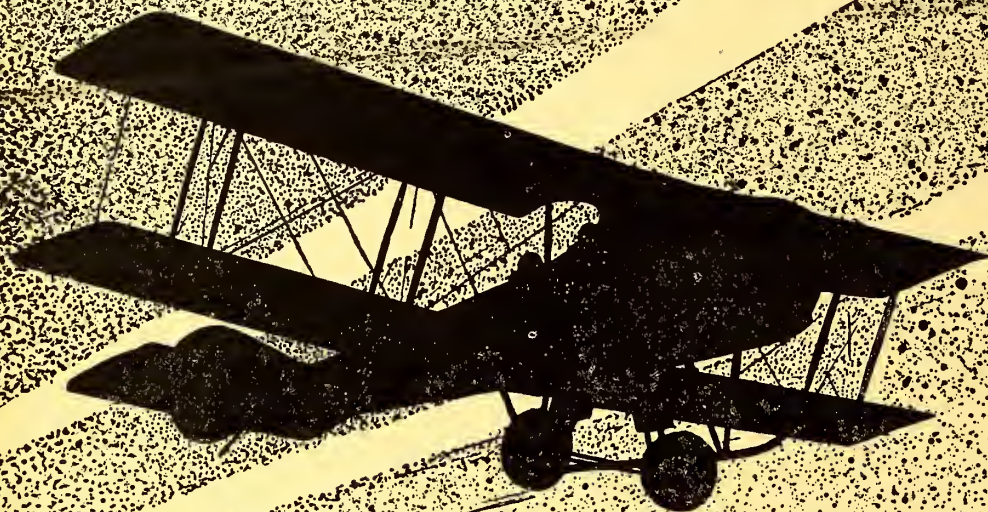
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ON A PARABLE OF FORESIGHT.

As a general rule, in a technical paper, one should confine oneself severely to the science with which that paper is concerned, but perhaps, for once in a way, one may be forgiven for telling a story about something else altogether, just for a change. At any rate, I will risk it.

Once upon a time there was a country which had a great reputation for the all-round sportsmanship of its inhabitants, but in this story we are especially concerned with horses. The people of this country bred horses of all sorts, for various useful purposes, but whatever the useful purpose might be they made a sport out of it. They bred very fast horses, called "thoroughbreds," for racing round hippodromes. They bred horses which were less fast, but were much stronger, so that they were good to carry a man across country, and to test their powers they raced them against one another in competitions called "over the sticks," or they rode them over other people's land behind a number of very fast dogs who made a musical and exciting noise as they ran—this was called "riding to hounds," and was a very dangerous sport, but it was a National Institution, and so no one minded being killed at it.

They bred small, sturdy ponies, and used them in a curious Oriental game called "polo," wherein the riders smote violently on a ball or on one another or on the next man's pony's shins with a heavy-headed stick. They bred other ponies which trotted very fast, harnessed to two small wheels on which the driver was perched. They bred big, heavy, slow horses for agricultural work, and for hauling heavy loads, but even here they made sport with them in ploughing matches, whereon the yokels of the district betted heavily and went for weeks without bacon when they lost.

TO EACH ITS USES.

All these horses had their uses in life, and also their uses in time of war. The thoroughbreds and the half-bred hunters made splendid mounts for the cavalry and horse-guns, for their blood told when they were hard pressed. The ponies were excellent for mounted infantry, which always had to be used in every war, though they were officially abolished before and after. The heavier horses were the only possible animals for heavy guns and transport.

And the various quarter-bred and bred-anyhow beasts in between were just what were wanted for field-guns, first-line transport, infantry majors, and other oddments. So that it was quite clear to most people with ordinary common sense that the sporting proclivities of the inhabitants of the country whereof I am writing were very useful to the country's defence.

Now it came to pass that in course of time two great

afflictions fell upon that land. Firstly, the inhabitants lost much of their love of sport. Instead of going forth on holidays and competing in teams each against each in healthy games which fostered local patriotism, they became mere lookers-on, and went by their tens of thousands on high days and holidays to arenas wherein a score plus two of wild men from the North beat one another with their boots to make sport for them.

And the richer people of that country rode in horseless carriages to open heaths where they struck strenuously with metal-headed clubs on the turf in the vicinity of small gutta-percha globes, which they set up as fetishes, that their contortions might stir up their livers and brighten their brains, and thus enable them to make more money by selling that which they had not for hard cash to those who did not wish to buy.

THE ANGER OF THE GODS.

Therefore the Gods of that country became angry, and they sent upon it the second affliction, to wit, a plague of Scientists, who made incantations with strange wands called "slide-rules," and wrote cabalistic figures called "formulae," which were said to prove much, but certainly taught nothing.

And certain of these Scientists, being much favoured in high places, persuaded those in power over the Army that by Science alone could the Army be properly horsed. They demonstrated by the Darwinian theory, and the law of Natural Selection, and other things that the unscientific horse-breeders of that land who cared only for sport could breed no true Army horses.

Therefore these Scientists were established at vast expense in a beautiful vale, where they organised a Royal Animal Farm, and gathered unto themselves many assistants, by the law of Natural Selection, naturally selecting their friends and relations, whether they had ever seen a horse or not. Then they asked sundry unsuspecting horse-breeders that the best horses might be sent them for inspection with a view to purchase. Whereafter, having obtained many interesting figures, and having used the best horses for stud purposes, the horse-breeders' animals were returned without many thanks as unsuitable.

Certain horses of foreign breeds were bought "just to go on with," while the Royal Animal Farm was evolving the Perfect Beast, but the native breeds were strenuously discouraged. The breeding of horses for sport was discouraged by forbidding young officers to ride for pleasure on other than official horses, so that the soldiers of that country no longer contested their great event, which they called "The Grand Military," nor did they jump against soldiers of other countries, nor could they ride to hounds, nor race in the minor events called "Point-to-Point."

A PERFECT BEAST.

In course of time, by scientific cross-breeding, from borrowed sires, the Farm produced its first animal, which, unhappily, having the fiddle head of a dray horse and the light barrel of a weedy thoroughbred, fell heavily on its nose and killed its jockey. Still, science, like virtue, has its own reward, and by careful study of unscientifically bred horses the Farm was rewarded by the arrival of an astonishingly good foal, which, on account of its many undeniably fine qualities, when it grew up, was known as the Beast Extraordinary. So successful was it as an all-round horse that it beat everything in the country.

Wherefore the Army, mesmerised by the success of the Royal Animal Farm, decided to use nothing else, if the breed could be standardised. This the Scientists said could be done, and in course of time the new animal, which was called for short the "B.E.," was produced in quantities to the exclusion of everything else.

THE REAL B.E.

The Beast Extraordinary, even when it was bred in numbers, was very good. It was a trifle tender in the mouth, but one got used to that. It was not as sure-footed as the old Arab breed, but if a rider let his mount slip it was regarded as his own fault, and if he was not killed he was told to walk in future. It was faster than a carriage horse, but not so fast as a thoroughbred, and though it could not haul a load like a dray horse it could get uphill better than a hackney. It took up more room in tight corners than a pony, but, then, no one wanted mounted infantry.

Many Army officers loved it. This was a democratic country, so some of them did not belong to the class who rode fast horses (the class the Romans called "equites"), and had never before ridden anything as good, let alone anything better, so they cried out for more B.E.s. Scientific soldiers admired its wonderful standardisation, which so simplified its equipment. All harness could be made dead to size, and riveted up. There need be no foolish adjustable bridles, or collars, or girths, with buckles that came adrift, and straps that had to have extra holes punched in them.

Everything was made dead to size, and fastened with fixed snap catches. The Government Inspectors measured the fittings with micrometers, and rejected leather which was one-hundredth of a millimetre wrong either way. Horses whose hoofs would not fit the standard shoe-gauge without either pushing or shaking were ruthlessly rejected. Everything was reduced to an exact science.

THE BROKEN BUSINESSES.

Naturally, many of the old unscientific horse-breeders retired from business. Some few went abroad, where their practical knowledge was appreciated, and so improved the various types of foreign horses. Others managed to exist by selling the best of their thoroughbreds to foreign Powers, but they had no incentive to improve the breed for home consumption, for sport was dying.

A few men with money, who had never before bred horses, took over the breeding of Beasts Extraordinary under official supervision, but they took no interest in the sport of horse-racing, or trotting, or ploughing. They bred Army horses as a commercial proposition. And so Sport died, for there was no temptation to spend money on it. A little private riding was done on cast B.E.s, or on animals that included some B.E. features, but not enough to make it worth while to produce anything better.

THE COMING OF WAR.

Then a war broke out. The Army went into it cheerfully, their horses equipped to the last bridle-rivet and standardised to a hair. But when the advanced cavalry met, the enemy on lighter but faster animals rode rings round the standardised horses, and "scuppered" the crowd. The hostile M.I. on light ponies could go where the Beasts Extraordinary could not find foothold. The heavy cavalry rode them down by sheer weight. The transport failed, and the gun-horses broke down with overwork.

It was found once more that history repeats itself, and that machine-made mediocrity must always give way before that which is genuinely the best, whether it be the product of natural genius, or whether it has simply grown accidentally. The machine-made article may find its way into that weird realm known as "the upper middle class," but it is never the same as the genuine aristocrat, and as it is with humanity so it is with human products.

A BOOTLESS QUEST.

Then the Military Authorities of that land sought throughout it for other horses fit for military work, but could find nothing but the cast B.E.s., and a few others which had been bred specially for perigrinating circuses, horses which at the word of their riders would stand on their heads, and roll over on their backs, but were quite useless for military purposes. The Royal Animal Farm had, it is true, produced a few weight-carriers and fast horses experimentally, but they had discouraged all products by independent breeders, so there was no supply in the hour of need. The mistake lay in that, through jealousy, they had standardised too soon on one type of their own instead of helping other people to try and produce something better of a similar type, and had killed all other types which would have been good for other purposes.

WHICH IS WHY.

So it came about that the horses that could be bought were worse than useless, and the enemy, well mounted on more varied but more efficient horses, dealt faithfully with them when and where they would. And that is why this sad story begins, "Once upon a time there was a country."

Which thing is a parable. An inspired schoolboy once defined a parable as "A heavenly story with no earthly meaning." Perhaps all this has no earthly meaning either—for some people.

[NOTE.—To the older readers of THE AEROPLANE the foregoing curious effusion will be familiar. It was, in fact, published in this paper on February 12, 1914, or almost exactly six months before the outbreak of war, and is republished for the benefit of several thousands of newer readers so that they may see what was common knowledge before the war. The parable appears now to require something in the nature of a sequel, and this may read as follows:—]

A NEW PARABLE.

Now, it came to pass that, when the Beast Extraordinary was over-ridden and outpaced by the enemy, some of those having Authority cast about that they might find a way to protect it, and thereby save their faces. And they discovered that certain evil persons, among those whom they had aforetime contemptuously called "The Trade," had privily studied the science of horse-breeding without official sanction, and had here and there produced a few horses greatly superior to the B.E., though the official class regarded them as mere horse-copers, and therefore only to be contemned.

And they said to them: Give us some of your horses. They are inferior to our standard horse, they are not so strongly built, they cannot carry such loads nor travel so far, and they cannot wear the official shoes or harness, and they are more dangerous to ride, but they are somewhat faster and handier, and perchance we can find a use for them.

So they took these fast little horses, which they called "Scouts," and they mounted on them their most skilful riders, but they did not use them for scouting. Instead, when a squadron on the Beasts Extraordinary went over into the enemy's country, a few of these skilful riders on Trade-bred Scouts were sent over to protect the squadron. And the quick little scout-horses, being nimble of foot, enabled their skilful riders to beat off the enemy's horsemen, so that the B.E.s. returned safely.

Then those officials who had fostered the Beast Extraordinary stood up in their Talking Places, and said: Behold how wonderful is our B.E.! See how it has entered into the enemy's country and has returned scatheless! And all the Learned Men employed by those in Authority addressed their disciples and said: Behold how wonderful is our B.E.! And all the writers on papyrus—except a few—wrote and said: Behold how wonderful is our B.E.! And people marvelled at it much. And those who knew the truth marvelled still more, for none told how the mere Trade Scout ponies had saved the Beasts Extraordinary from extermination.

CONTRARY TO REGULATIONS.

Thereafter it came to pass that some of the fighting men came home from the war, some merely to rest, and some broken by fighting. And all clamoured for better horses. Some spoke too loudly, and those in Authority were displeased, and sent them back to fight on their feet as common soldiers. Some others went privily to the horse-copers, known as the Trade, and said: Breed us better horses. And others spoke, contrary to orders, to demagogues of the Talking Place, and to scurrilous writers, who said aloud: Our fighting men must be better mounted.

And those in Authority grew afraid, and appointed an Animal Enquiry Council which should see into this matter. And this Council consulted together for many days, and presently it announced to the people that the Chief Demagogue had lied—only it said it in many polite words instead of in one rude one. But it said privily to the authorities: This man came very near the truth. See to it that ye be not found out next time.

And after many moons, when the people had forgotten all about it, the Council issued a long report, recommending nearly all those things which the agitators had recommended a year or two years before. But the first announcement of the Council had white-washed the authorities in the eyes of the people. So that was that.

TAKE THE CASH AND LET THE CREDIT GO.

But during this time the mere Trade had bred many more horses. For it found that, although the Beast Extraordinary and its official cousin bred at the Royal Animal Farm got all the credit, it was possible for the Trade to get the cash—except such as was seized by the tax-gatherer—so long as it continued to supply horses which were better than those bred at the R.A.F., in order that the B.E. & Company could be protected. And many of these Trade Beasts became so good that those who rode them preferred them to the official beasts.

So the officials of the Royal Animal Farm took

thought as to how it could improve the B.E. First they flattened out its form, so that it should be faster. But this prevented it from carrying its load. Then they made it longer. But this decreased its speed. And so it remained about where it was, except that careful breeding increased the power of its heart and gave it a little more stamina. But the Trade Beasts improved still more rapidly, and the name of the Beast Extraordinary did not find favour with the fighting horsemen in those days.

THE REALLY EXCELLENT ANIMAL.

So the Royal Animal Farm made more experiments and produced a bigger and more powerful and faster animal, which they thought was Really Excellent, and so it was called the R.E. But this Really Excellent animal was heavy in the head, and long in the legs, and uncontrollable except by very experienced riders, so that it stood on its nose when merely leaving its stable, and broke its rider's neck or his legs, or its silly self. And when it tried to go slowly it fell over or dived on its head and killed itself and its rider. And it was so long and awkward that it could not turn quickly when attacked. Therefore many riders hated it like anything, and it became commonly known as the R.E. Hate.

Then he who spoke on behalf of the Authorities in the Lower National Talking Place said: Behold our riders at the war clamour for this Really Excellent animal. But doubtless he was misled by the error of a scribe who had prepared the official papyrus from which he read, and should have said that they clamoured at it.

THE ANIMAL BOARD OF CONTROL.

And while these things were happening, the Powers in that Land issued a decree that all the breeding of horses should be in charge of a special Animal Board. And that none should experiment with new breeds except by order of the Board. So that none of the horse-copers of the Trade dared produce improved horses without the approval of the Experts of the Board. Which might have been good if these experts had themselves ridden against the enemy. But some of the experts had never seen an enemy in the field; and some had been concerned in breeding the Beast Extraordinary or the Really Excellent Animal, and some knew nothing about horses, but had spent their lives in grinding axes and in other strange occupations. So the horsemen of the Army and those who loved them began to have fears that the Animal Board was merely another name for the Royal Animal Farm, with still greater power. But these things be on the lap of the Gods. And the officials were in the lap of luxury, spaciouly housed in that City's greatest Caravanserai.

A MULTITUDE OF COUNCILLORS.

And the Powers that Were decreed also that another Council be set up to consider what uses could be found for all these Officially Approved horses after the war. And they appointed to that Council some few breeders of real horses, and several who had been concerned in the Royal Animal Farm, and many who talked in both the National Talking Places, and a prophet who was with honour in his own country—though void of technical knowledge—and one real soldier who knew. And they set over them a Lord of many Papyri, with one of the official talkers from the Lower Talking Place as his deputy. And the People of that Land said: In a multitude of Councillors there is wisdom. And some said: Too many cooks spoil the broth. And others again said: Oh, damn these Committees! Let's get the war off our chests first. And they went

on with the war. And these things also be on the lap of the Gods.

AND THE MERE FIGHTING MEN.

But those who fought continued to fight. And because of the mere Trade Beasts they held their own, and many times triumphed over the enemy. For some Trade Beasts were smaller and faster, and had greater hearts than any in the world, and ran rings round the Official Best and the Enemy's Best alike. And some were bigger and nearly as fast, and their riders went far into the enemy's country, returning with much news and many beautiful pictures, so that the Army knew the enemy's country as well as its own. And some Trade Beasts were so big and powerful that they dragged many tons of the material of death in one

load to immense heights which the Beast Extraordinary and the Really Excellent Animal could never reach, even when stripped for racing. And from these great heights death and destruction were hurled onto the enemy when he slept.

And so the war progressed fairly well, thank you, but not so well as if the experienced horse-breeders and the fighting horsemen had been allowed to take council together, and breed the horses that were wanted, without let or hindrance from the Powers that Were.

And the rest of the History of the Trade Beasts, and the Really Excellent Animals, and the doings of the Animal Board, and of the Council of After-the-War Civil—or uncivil—Transport, shall they not be found in the After-the-War Chronicles of the Breeders of Good Beasts?—C. G. G.

Raids and Reprisals.

If it were not for the suffering inflicted on those poor little children in the East End, the aeroplane raid of June 13th would have been one of the humours of the war, not so much because of its immediate effects, but because of the row afterwards. So far as the children are concerned we have to blame ourselves more than the German raiders.

The raid has been prophesied ever since Louis Blériot flew the Channel in July, 1909, and demonstrated that Great Britain is no longer an island. The people of this country ignored the warning, they neglected the development of aircraft, they elected to Parliament and upheld in their actions legislators who were indifferent to, or deliberately lied about, the Flying Services, they abused the few legislators who endeavoured to develop the Flying Services, and now they have got a little of that for which they asked. It is hard to find any sympathy for them.

Many competent military people regard the bombing aeroplane purely as a long-range gun. As Lt.-Col. O'Gorman remarked on Wednesday night, "The aeroplane occupies an exciting position half-way between a battleship and a cartridge"—as neat a description as could be invented. If one is within range of a battleship or of a cartridge one is within the area of military operations, and civilians in that area must be content to take risks accordingly.

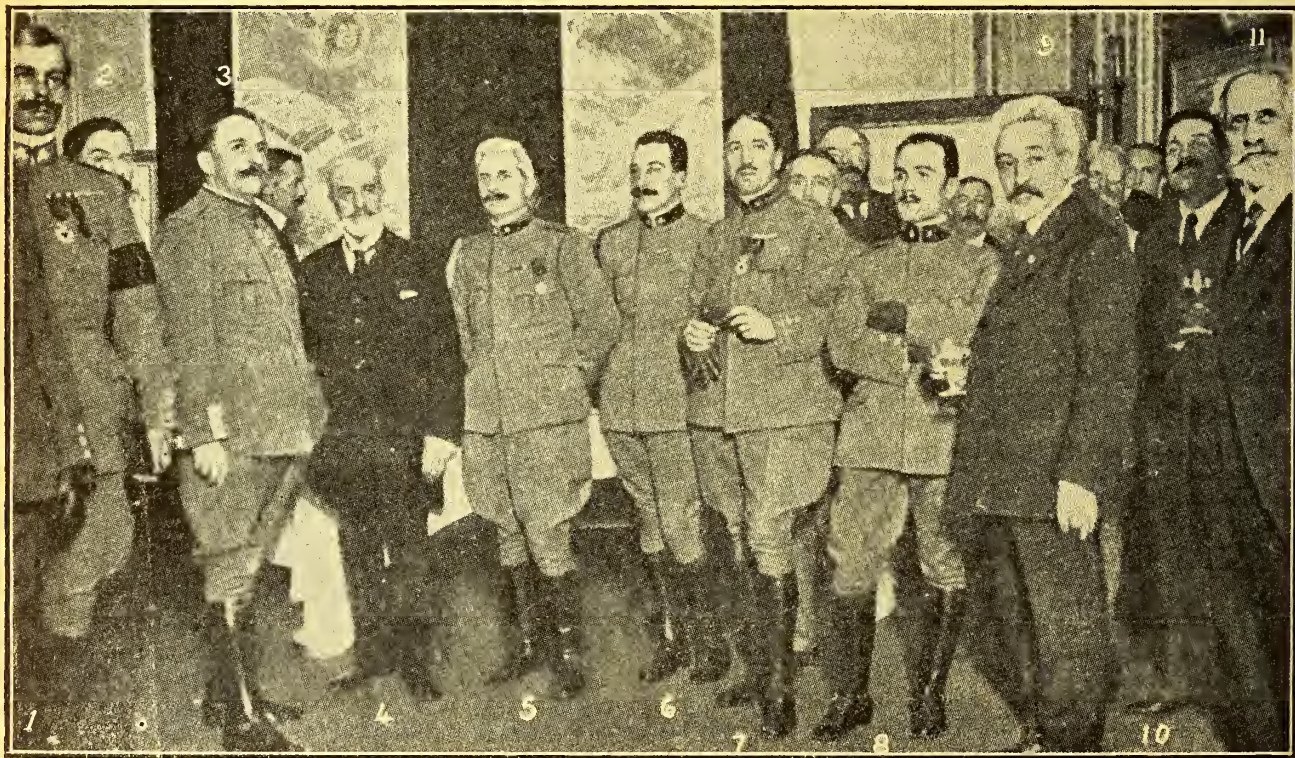
French children within range of big guns go to school in steel helmets and gas-masks. We are not yet forced to such

precautions, but if we should be we shall not be able to blame anyone except ourselves. It would be absurd to suppose that the bomb which fell in the school at Poplar was aimed at the school when there were so many more interesting targets in the vicinity, so one must regard that incident as a lamentable accident.

I have had under my personal notice for the past ten days or more the infant child of one of my greatest friends, who, in one of the crack London hospitals, has been suffering at least as much from the ignorance, carelessness, and callousness of certain of those much-lauded and allegedly saintlike women our trained hospital nurses as those poor little things at Poplar have suffered from German raiders, so I find it difficult to be more irate with the Germans for causing needless suffering to several children by accident than I do with these nurses for causing needless suffering to one child by carelessness. Of the two it would seem that the nurses are the worse sinners against humanity.

LOGIC AND SCRIPTURE.

If one wished to be rigidly logical one might even argue that in destroying a male child of five years of age an enemy is merely decreasing the 1930 Class of Recruits, and that in killing a female child of five years of age an enemy is decreasing the prospective mothers of the 1950 Class, or thereabouts. But one has to go back to the foundation of our State Religion, the Old Testament, to find justification for such logical savagery in



The Italian Aeronautical Commission in Paris and their hosts at the Aero Club de France:—(1) Colonel Moizo; (2) M. Georges Besançon; (3) General Giovanni Marini; (4) M. Henry Deutsch de la Meurthe; (5) Colonel Ricaldoni; (6) Captain Donati; (7) Captain Beltramo; (8) Lieut. Maffei; (9) M. Louis Capazza; (10) M. René Labouchère; (11) Maître Ed. Clunet.

. The .

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war, so I will not press the point. Nevertheless full justification may be found in that interesting book, as, for instance, when Moses was ordered by Jehovah to slay all the males of the Midianites, "every male among the little ones," besides the married women. The Book of Joshua discloses passages comparable only with the Reports issued by the various Allied Governments on German atrocities in Belgium. Joshua was ordered by his God—who, I believe, is supposed to be ours—to destroy everything, so that "there was nothing left to breathe." At the capture of Jericho Joshua was ordered to put "man and woman, young and old, ox and sheep and ass to the sword," and did it, always excepting the lady friend of certain of his secret service officers.

The Amorites and the people of Bashan, like the Belgians, defended their frontiers against the passage of foreign troops. The Bible states that God ordered Moses to destroy them all "until none was left alive." And we, who regard the Old Testament as a sacred and inspired book, set up a pious howl against a few air raids which only occur because of our own stupidity and negligence.

For further information on our national hypocrisy I refer my readers to that brilliant and pitilessly humorous book, "What Lies Beneath," by W. R. Paterson (Benjamin Swift), to whom I am indebted for reference to certain passages quoted above. As one of his characters says:—"History is a blood bath! That's your world—that's your Old Testament. In England we bind it in the smooth vellum of British cant."

AS TO REPRISALS.

The shriek for reprisals is really too funny. The military actions which the popular voice calls reprisals are merely normal operations of war which have unfortunately been impossible hitherto owing primarily to the national neglect of aircraft, and secondarily to the astounding incompetence of those who in the early days of the war were charged by the Government with the production of aircraft. The amount of material and man-hours wasted by ignorant or knavish or foolish officials during the first two years of war would have built an air fleet which would have wiped off the map every German town within 100 miles of our fighting line.

Some day, when the Censor is dead, I hope to write the full story of what certain of our bombing squadrons wanted to do and were unable to do thanks to muddling and intrigues at home. If those bombing squadrons had been intelligently supported, properly equipped, and adequately reinforced as the importance of their work increased, there would have been no raids on London, and no dead and maimed children in the East End.

Reprisals, as such, are sheer hypocritical humbug. All we need demand is the effective prosecution of the war in the air on normal lines. All this agitation for reprisals is merely a dodge to cover up the sins of omission of the late Government.

THE JEST OF THE WAR.

The jest of the war was to see Mr. Pemberton-Billing, M.P., Mr. Warwick Brookes, M.P., Mr. Yeo, M.P., Mr. Hogge, M.P., Mr. Basil Peto, M.P., Mr. Flavin, M.P., and the Lord Mayor of London on the same platform, on Sunday, June 17th (note the date for historical reference), gathered together by the "Daily Express" and supported by letters from Mr. Joynson-Hicks, M.P., and Mr. Ben Tillett, to demand—as the result of Hun Hunnishness—the putting into operation of ordinary acts of war which ought to have taken place two years ago and should have continued ever since.

I may be wrong, but I have long been under the impression that the "Daily Express" is largely influenced by Mr. Bonar Law. When Mr. Pemberton-Billing had dared to force his way into

THE REPRISALS MEETING.

On Sunday, June 17th, a mass meeting, organised by the "Daily Express," was held in the Stoll Picture Palace, Kingsway (late the Hammerstein Opera House), to advocate reprisals for the recent air raids upon London and the south of England.

The Lord Mayor of London took the chair, and was supported by the Mayors of many London boroughs, by Lord Inverclyde, and various Members of Parliament. The vast building was packed, and the audience was enthusiastic.

The Lord Mayor announced that he intended in future to make public to the citizens of London the warnings of air raids issued by Lord French to the police.

A resolution was passed demanding a policy of ceaseless reprisals upon German towns in order that their populations might experience the effects of aerial warfare, and as an inducement to the enemy to cease such action. It was asked that the resolution should be presented to the King and Queen as well as to the Prime Minister.

Mr. Basil Peto, M.P., pointed out that Frankfort was the home of the financiers who did so much to engineer the war, and should therefore be bombed.

Mr. N. Pemberton-Billing, M.P., who was received with wild enthusiasm, supported the resolution, and accepted the Lord Mayor's ruling not to attack the Government at that meeting, with the proviso that it would be the last meeting which he would address without attacking the Government unless we were

Parliament against the intrigues of the Coalition, the "Express" jeered and sneered at him, as befitted a loyal journalistic supporter of the Government. Now that almost every word Mr. Pemberton-Billing has spoken has been proved true and has been forcibly stuffed down the Government's throat by the enemy, the "Express" starts an agitation for reprisals against the Hun, and enlists Mr. Pemberton-Billing's aid, which, being a sportsman, he has given willingly and freely.

But you will doubtless perceive how much more desirable it is that exasperated public feeling should be worked off in a skilfully guided and organised agitation against the enemy, than that the same exasperation should be allowed to cut loose and organise itself into an agitation against Government officials and their incompetent friends and protégés who are really to blame for the slaughter of the innocents. Mr. Bonar Law may not be much of a statesman, but he is a singularly astute politician.

WARNINGS.

On the subject of warnings there is little to be said. The people of London do not know what they want themselves. A friend of mine has an office close by which a number of bombs fell. His aged managing clerk, a typical honest Englishman, complained bitterly, while the bombs were falling, that they had had no warning. Next day a bogey warning got round somehow, and the office migrated downstairs. After half an hour of doing nothing, the old man began grumbling that he was wasting time, and proceeded to stomp upstairs, saying that he would come down again when the raid began. Now, what can one do with people like that?

The soundest reason against warnings was that given in Parliament last week by Sir George Cave, who objected that warnings mean loss of man-hours, as workers once warned went home and did not come back, and so decreased the output of munitions of war, which was precisely the same argument as that which I used months ago in an article on the military value of Zeppelins, for which a certain paper in the North was prosecuted under the Defence of the Realm Act. The time is not ripe for the publication of the story of that prosecution, and as the case was withdrawn after an official witness had made rather a bad howler in his evidence, the details can keep till the Censor is dead or till some special circumstance makes it policy to publish the yarn in full. It is really very humorous.

A SUMMARY.

Personally I find myself for once rather inclined to the official view that warnings are not worth while.

As regards reprisals, as such they are a mere absurdity, but if we can spare enough machines from the Army's needs, or if America can send us aeroplanes which are fit to fly on active service—which remains to be proved—then we must, unless we are bigger fools than even our official records suggest, set to work seriously to extend our war area into Germany as far as our aeroplanes can reach. Which merely means laying waste every German town within flying distance with all the effectiveness ordered by Jehovah of the Jews.

As regards the Home Defence Forces, they have done extraordinarily well under very difficult circumstances, and will do vastly better before long. Therefore if any reader hears the ignorant "grandmother in the street" blaming Home Command H.Q. for air raid results, he need merely say that the person to blame is not the Hun, nor Home Defence, but merely the idiot English voter who elected the House of Commons which elected the Government which appointed the Heads of Departments who put our Flying Services into incompetent hands, and so produced lamentable results which present efficient administration has not yet had time to put right.—C. G. G.

dropping bombs in Germany within three days. He advocated the policy of attacking towns other than those most strongly defended, as the most effective method of scaring the German people and causing the greatest moral effect, and representing the smallest risk to our own aviators.

The crowd followed the speakers into the street, and demanded another speech from Mr. Pemberton-Billing.

THE EDUCATION OF GLASGOW.

The Aeronautical History Exhibition, which has been so successfully organised by the Countess of Drogheda in aid of the Flying Services Hospitals and Lord French's war charities, is now known as the Official Air Services Exhibition, and is under the auspices of the Army Council and Air Board. As already noted, the Exhibition has been a great success in Birmingham, Coventry, Liverpool, and Manchester. Now, the sister Kingdom of Scotland is to have an opportunity of being educated in aeronautical matters. The Exhibition is being removed to Glasgow, where it will be located at the McLellan Galleries. The Duke of Atholl, Chairman of the Royal Aero Club, and himself one of the pioneers of aviation in this country, will perform the opening ceremony on July 25th, and the Exhibition will remain there for two weeks. It is hoped that all Scottish readers of this paper will give their very best energies to spreading the news among their friends to make the Exhibition as big a success in Glasgow as it has been in the land of the mere Englishman.



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AIR RAIDS.

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... "Only what we lose, we cherish;
Only pluck the flowers that perish;
Only what we have not, spend."

JOHN ADDINGTON SYMONDS.

That insularity of position which has given to Great Britain the Nonconformist Conscience and its sometime prowess on the seas has also preserved the nation from the immediate horrors of war since the days when King and Parliament put their disagreement on the ethics of government to the test of the sword. Through the maintenance of a large Navy, manned by personnel possessing instinctive knowledge of the sea, invasion had become unknown for centuries.

A war in which England was a party cost money and the lives of fighting men. The civil population were preserved from all harm. The military forces were small, and the necessary casualties in action brought sorrow to but few families. The people in general suffered slightly from an increase in taxation and an occasional shortness of food.

These losses were frequently balanced by gains in territory and by the indemnity forced from a beaten enemy. But the intimate ghastliness of war was reserved for the decent seclusion of foreign lands. The daily news-prints alone brought horror to this land.

THE NEW ORDER.

But the old order is changed. The advent of aircraft has made possible an invasion of England. The belt of water which has previously been an adequate protection against attack from without is no help against the aviators and aeronauts of the enemy. In consequence, the Central Powers have bombed certain areas of Great Britain from aircraft on various occasions.

These attacks, which in the sum caused but infinitesimal damage, were regarded by the startled public

as an impertinence, an insult from a Power which should have known better. The very immunity of the land from invasion roused, when at last the day of trouble arrived, a fury of indignation against the enemy country and against those who were responsible for the protection of this country against such attack.

For the first time people saw relatives and friends killed by an act of the King's enemies instead of reading an exciting account in a cheap print of death and destruction in some land where these things are proper. This element of public feeling, unreasoning in its expression, is one of great importance in all questions of national defence. Because of it, the authorities are never free agents in the production and execution of their plans.

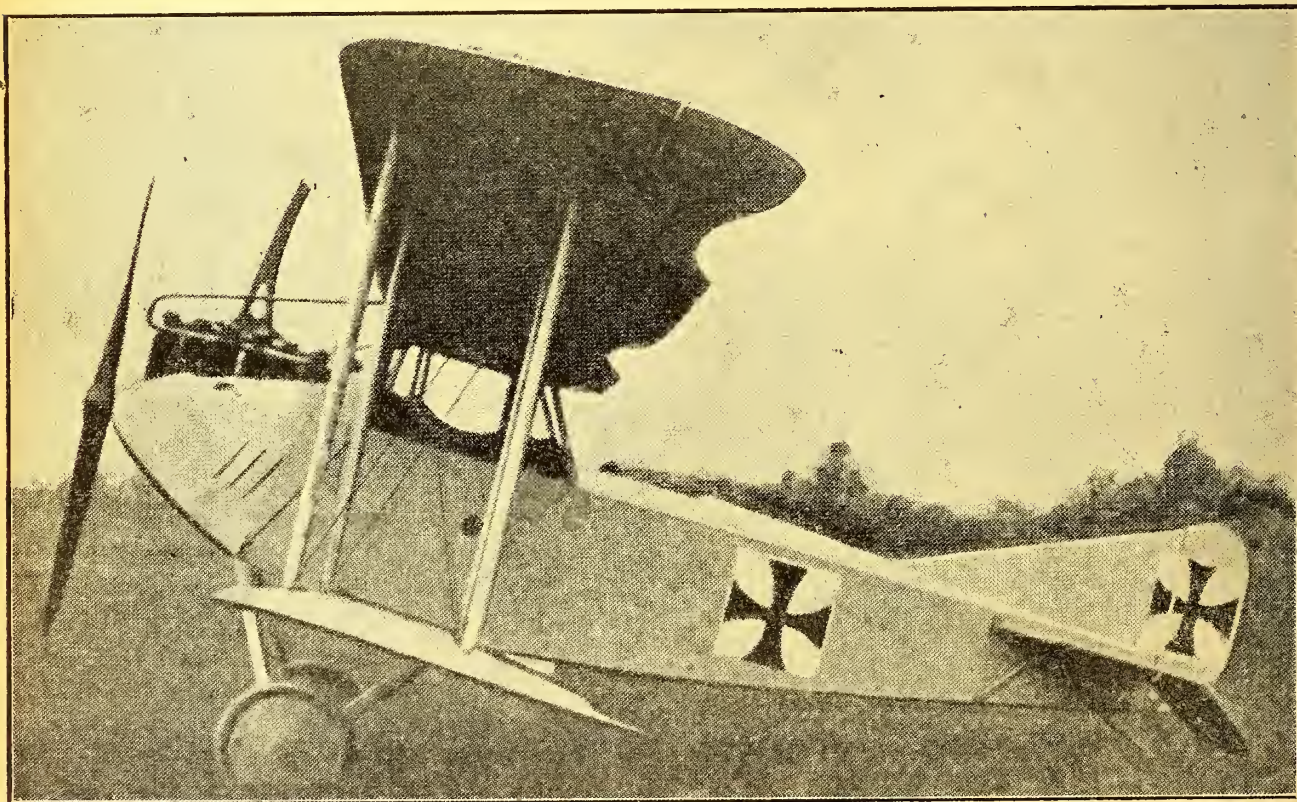
THE FIRST EXPERIENCE.

The first form of air-raid to which this country was subjected was that by airship—generally of the Zeppelin type. For some time, until an efficient department took over the duties of aerial defence, the invading aerial squadrons flew from point to point with immunity, causing considerable damage in inhabited areas.

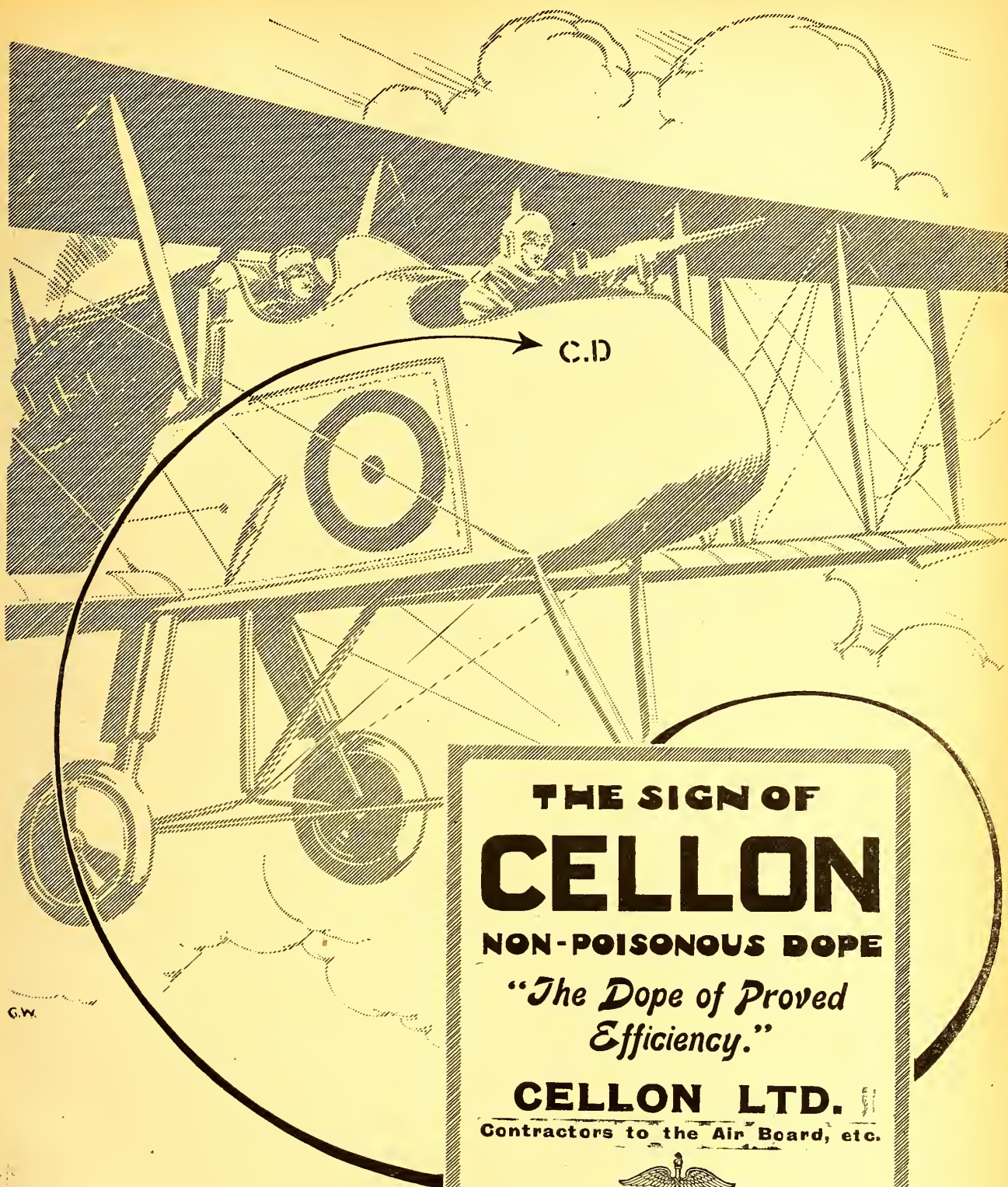
But with the coming of system the risk to invading airships became so high that such air raids are no longer of value to the enemy. The menace from airships is over until some further aeronautical discovery again alters the conditions. The aeroplane, as was prophesied ten years ago by those with instinctive appreciation of the obvious, is completely the master of the airship in aerial warfare.

THE LATER PHASE.

But of recent months raids have been made by aeroplane. So far, with one unimportant exception, these raids have all been by day, and the damage until recently has been slight. But during the past fortnight



Reproduced from "L'Aerophile."
A 1917 type A.E.G. (Mercedes 175-h.p. Engine). As may be seen, it is a small two-seater with a big engine, and is evidently intended as a reply to the 1½ strut Sopwiths and machines of similar calibre.



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KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.

two raids have been made, in which the casualties were high, while the damage inflicted on the raiding squadron was below the percentage which from the German point of view would justify the expedition.

The public in its indignation only takes into account the damage done and the lives lost without balancing against these the losses of the raiders on the way home from the scene of action. Criticism is directed against (i) inadequate defences, (ii) lack of preliminary warning, and (iii) lack of immediate and strenuous reprisals.

DEFENCE.

To deal firstly with the question of defence against raids, there are certain points in favour of the raider which must be borne in mind. An aeroplane is a small object in comparison with an airship of even the smallest dimensions, it can climb rapidly to great heights, and it possesses great speed. These qualities make anti-aircraft attack by gunfire one of very great difficulty. Also, the period for warning is slight.

The nearest aerodrome in German hands from which flights to this country can begin is in the neighbourhood of Ostend. The distance from Ostend to the nearest point of the English coast is seventy miles, while London itself is only seventy miles farther away. That is to say, an aeroplane of the bomb-dropping type, capable of a speed of eighty miles an hour, can on a calm day reach London in less than two hours.

Consequently it will be readily understood with what ease a German aeroplane squadron, taking advantage of a misty day, can reach London almost without notice before any effective measures can be taken to prevent its arrival. Gunfire alone can be brought into effect before the enemy reaches the objective under conditions of this nature, as defending aeroplanes require time to rise to the enemy's altitude, and, when there, to overtake the quarry. It is therefore necessary to make certain that, whatever damage may be done by the enemy, he shall not return to his base if it is humanly possible to prevent him by death or capture.

THE PATROL FALLACY.

It is suggested by those who rarely think that the maintenance of an aerial patrol over the British coast by night and by day would be an effective measure of defence. So it would be, were it only possible.

A little thought will give some indication of the number of aeroplanes required for a patrol of this kind. Even an allowance of an aeroplane for each five miles of coast over a total stretch of one hundred miles would require twenty aeroplanes at any given moment.

Assuming the aeroplane would be capable of six hours' patrolling in each twenty-four hours, the pilot and observer being changed from time to time, it would be necessary to set aside eighty aeroplanes, apart from any reserve. But a patrol of this nature would only be of value for observation purposes, a category of duty which can be carried out as effectively from the ground.

One aeroplane patrolling a five-mile line would be unable to oppose the passage of one or more enemy squadrons. Thus, if the patrol were to be for fighting purposes, it must be of a strength comparable with that of the raiding enemy. The impossibility of an effective fighting patrol under present conditions should be obvious even to the most querulous and worst-informed critic.

FORM WITHOUT SUBSTANCE.

To provide the necessary aeroplanes for this manner of work it would be necessary to rob the troops in the field of some of their machines. There are, it is true, a large number of aeroplanes which could with some trouble be diverted to anti-air-raid work at home, but

these machines are of types possessing qualities greatly inferior to those with which the enemy attacks the "fortress of London." Such machines would give the appearance of a firm defence without the substance.

The armies in the field have never yet had their full proportion of aircraft because, though the output increases, the uses of aircraft grow, and the demand ever outreaches the supply. Unless the war continues for several more years, the supply of highly efficient aeroplanes will never keep pace with the work to be done.

WHERE AIRCRAFT ARE NEEDED.

The recent retreats of the German forces on the Western front and their inability to make successful counter-offensives is very largely due to their lack of effective aerial reconnaissance. During the last few months the Royal Flying Corps have acquired an ascendancy over the enemy flying service. Each hour of the day the results of aerial reconnaissance are seen in the operation orders which lead to success, while the blindness of the enemy, owing to the tactical inferiority of his aviators, becomes more and more obvious.

He has foolishly, or so it would seem, withdrawn aircraft of high excellence from his battle line in order to employ them in a series of aerial invasions of England, but whether his action is really as foolish as it appears depends entirely on the behaviour of the democracy of England and on the power of the politicians to lead rather than to follow public opinion.

THE EVIL OF INTERFERENCE.

If the panic-stricken demands of those whose areas have suffered damage from aerial bombardment are responded to by keeping back aeroplanes from the urgent duties of the battle line, then the action of the Germans is not altogether foolish. Their raids will then possess "military value," and lack of equanimity at home will have had its due result. Nothing should be permitted to interfere with the vigorous prosecution of the war.

It should not be thought that, because the authorities do not answer in detail the questions and criticisms appearing in the Press and embodied in the speeches of hysterical demagogues, that there is no adequate reply. Public controversy is no field for the soldier. The reply is shown in his work, the effects of which cannot be realised in a day.

As has been reiterated time and time again in these pages, the best cure for air raids is prevention by means of a continual aerial offensive directed against enemy aerodromes. There is no other solution save that of bringing the war to an end.

WARNINGS.

The general public, if one is to believe the word of those who profess to speak for the public, desire greatly that warning should be issued when an air raid is imminent. If such warning would save human life, few would object to the additional complication caused thereby, but it is a regrettable fact that the common mob treat an air raid as a rare show until one of them is injured, when furious indignation takes the place of morbid interest.

Apart from the necessity of keeping the common routine of life in its accustomed channels, it must not be forgotten that the issue of warning occupies the time of people who should be engaged in dealing with the raid itself, and uses telephone wires which are overcrowded with messages of vital tactical importance.

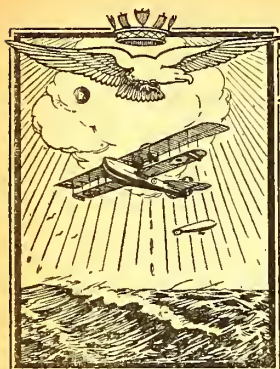
Unpopular though the advice may be, it is nevertheless only honest to ask the public to trust those in whose hands the direction of anti-aircraft action lies. They are doing their best, and it is wasteful to shoot them.

The "Bristol" Aeroplanes

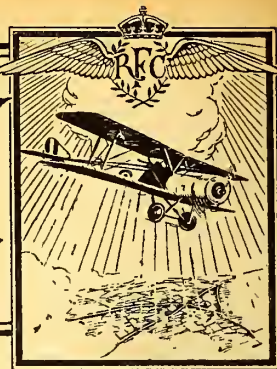


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FROM THE "LONDON GAZETTE."

WAR OFFICE, June 12th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
Sqn. Comdr.—Capt. H. J. F. Hunter, M.C., Rif. Brig., from a
Flt. Comdr., and to be temp. Maj. whilst so empld., June 1st.

Flt. Comdrs.—From Flying Officers and to be temp. Capts.
whilst so empld.:—Temp. Sec. Lt. G. H. Cock, Gen. List,
May 20th. Temp. Sec. Lt. G. Knight, Gen. List; Sec. Lt.
F. W. Ward, N. Staff. R., May 23rd. Temp. Lt. T. F. Hazell,
Gen. List; Lt. A. B. Fanstone, Spec. Res.; Lt. T. Perkins,
Spec. Res. (since killed in action), May 25. Sec. Lt. E. B.
Cahusac, S. Staff. R., Spec. Res., May 26th. Temp. Sec. Lt.
P. W. Chambers, Gen. List, May 27th.

WAR OFFICE, June 13th.

REGULAR FORCES.—ESTABLISHMENTS.—Park Comdr.—
Temp. Maj. A. E. G. MacCallum, Gen. List, from an Insp. of
Technical Training (graded as a Sqn. Comdr.), April 10th.

Spec. Appt.—(Graded as a Park Comdr.)—Temp. Lt. (temp.
Capt.) G. R. Moser, Arg. and Suthd. Highrs., from a R.F.C.
Staff Officer, 3rd Cl., and to be temp. Maj. whilst so empld.,
vice Lt. (temp. Maj.) B. S. Foster, Hamps. R., T.F., May 17th.

WAR OFFICE, June 14th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Wing Comdr.—Maj. I. A. E. Edwards, R.A., from a Sqn.
Comdr., and to be temp. Lt.-Col. whilst so empld., June 2nd.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts.
whilst so empld.:—Sec. Lt. (temp. Lt.) D. C. Cunnell, Hamps.
R., T.F., May 14th. Sec. Lt. C. E. Robertson, Spec. Res.;
temp. Sec. Lt. R. C. Savery, Gen. List, May 28th. Sec. Lt.
(temp. Lt.) T. Q. Back, R.F.A., T.F., and to be secd., May 30th.
Lt. E. B. Macmanus, Spec. Res., May 31st.

MEMORANDUM.—Sgt. D. A. Stewart, from R.F.C., to be temp.
Sec. Lt. for duty with the Mil. Wing of that Corps, May 29th.

TERRITORIAL FORCE.—R.G.A.—Sec. Lt. to be Lt.—Sec.
Lt. (temp. Capt., R.F.C.) C. T. Latch, with precedence as from
June 1st, 1916, to retain temp. rank of Capt., R.F.C., and to
remain secd., June 15th.

INFANTRY.—NOTES AND DERBY R.—Lt. A. Ball, V.C., D.S.O.,
M.C. (since killed in action), to be Capt., with precedence as from
Nov. 30th, 1916, and to remain secd.

WAR OFFICE, June 15th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Staff Officer, 3rd Cl.—(Graded for pay as a Staff Capt.)—Temp.
Capt. V. Ward-Brown, M.C., Gen. List, vice temp. Lt. (temp.
Capt.) G. R. Moser, Arg. and Suth'd Highrs., May 17th.

Sqn. Comdr.—Capt. (temp. Maj.) J. Valentine, Spec. Res.,
from a Flt. Comdr., and to retain his temp. rank whilst specially
empld., May 25th.

Flt. Comdrs.—From Flying Officers, and to be temp. Capts.
whilst so empld.:—Temp. Lt. H. E. Fletcher, Gen. List, May
22nd. Lt. T. McD. Hawker, R. Ir. Fus., Spec. Res., May 26th.
Sec. Lt. (temp. Lt.) C. F. Denning, M.C., R.W. Surr. R., Spec.
Res., May 28th.

* * *

A supplement to the "London Gazette," issued on June 15th,
contains a dispatch from Rear-Admiral E. Charlton, Commander-
in-Chief, Cape of Good Hope Station, describing the operations
on the coast of German East Africa carried out by his squadron
in August and September, 1916.

The following reference is made to work of the R.N.A.S. in
connection with the capture of Bagamoyo:—

At 6.30 a.m. it was reported from three sources—kite balloon,
portable W./T., set ashore, and W./T. from seaplane—that the
enemy were retiring between the French Mission and the sea,
and were around the Mission.

* * *

The King has been pleased to approve of the award of the fol-
lowing Order and Decorations:—

DISTINGUISHED SERVICE ORDER.

Flt. Lt. E. R. Moon, R.N. (now prisoner of war).

Since April, 1916, has carried out constant flights over the

enemy's coast, including reconnaissances, bomb-dropping, and
spotting for gun-fire in all weathers. Has shown great coolness
and resource on all occasions.

DISTINGUISHED SERVICE CROSS.

Flt. Lt. J. E. Baker Maclean, R.N.

Since April, 1916, has carried out constant flights over the
enemy's coast, including reconnaissances, bomb-dropping, and
spotting; was wounded when flying over Bagamoyo.

DISTINGUISHED SERVICE MEDAL.

Chief Petty Officer (C) J. Noonan, R.N.A.S., O.N. M.2345 (Po.).
Air Mech., 1st Grade, F. Wilmshurst, R.N.A.S., J.29563 (Po.).

MENTIONED IN DISPATCHES.

The following is the list of officers and men mentioned in Rear-
Admiral Charlton's dispatch:—

Flt. Lt. E. R. Moon, R.N.

Flt. Lt. J. E. B. Maclean, R.N.

Chief Petty Officers (C) J. Noonan, R.N.A.S., M.2345 (Po.).

Air Mech., 1st Grade, F. Wilmshurst, R.N.A.S., J.29563 (Po.).

* * *

The King has further approved of the award of the Distin-
guished Service Cross to the undermentioned Officers in recogni-
tion of their services with the East African Military Forces:—

Sqn. Comdr. E. R. C. Nanson, R.N.

Organised his unit with great efficiency and zeal, and carried
out reconnaissance work under great climatic difficulties.

Flt. Sub-Lt. L. O. Brown, R.N.

For bravery, zeal, and ability shown in many long flights
over enemy territory on reconnaissance work and bomb-drop-
ping expeditions; was repeatedly under fire.

Flt. Lt. N. G. Stewart-Dawson, R.N.

Carried out reconnaissances over difficult country on May
30th, 1916, when he was obliged to land in the bush.

The following Officers and men have been mentioned in dis-
patches:—

Flt. Lt. John Robinson, R.N.A.S.

Lt. Ivor Mackenzie Bellairs, R.N.V.R.

C.P.O. Mech., 2nd Grade, A. H. Simmonds, M.443 (Cha.).

C.P.O. Mech., 3rd Grade, H. Russel, 226512 (Cha.).

Ldg. Mech. S. A. Brooke, F.7963.

C.P.O., 3rd Grade, W. A. Chapple, F.7181.

E. Mathais, M.6508 (Dev.).

Ldg. Mech. A. F. Wardle, F.7334.

Air Mech., 2nd Grade, J. H. Seager, F.7818.

Actg. Air Mech., 1st Grade, A. E. Liles, F.7811.

* * *

WAR OFFICE, June 16th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
—Sqn. Comdrs.—From Flt. Comdrs., and to be temp. Majs.
whilst so empld.:—Lt. (temp. Capt.) C. C. Miles, M.C., Spec.
Res., March 19th. Capt. H. F. A. Gordon, York. and Lanc. R.,
June 3rd.

Flt. Comdrs.—Capt. F. W. Hudson, Norf. R., from a Flying
Officer, May 23rd. From Flying Officers, and to be temp. Capts.
whilst so empld.:—Sec. Lt. A. G. Jones-Williams, Welsh R.,
May 25th. Temp. Sec. Lt. B. Mews, Gen. List, May 28th.
Temp. Sec. Lt. J. W. Somers, Gen. List, June 7th.

Adjts.—From Flying Officers (Observers):—Lt. L. A. K. Butt,
S. Staff. R., May 18th. Temp. Lt. W. L. Hill, Gen. List, May
26th.

Equipment Officers., 1st Cl.—And to be temp. Capts. whilst
so empld.:—Temp Hon. Lt. W. S. Smith, Gen. List; Sec. Lt.
C. L. Archbold, from the 3rd Cl., May 27th.

WAR OFFICE, June 18th.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
Equt. Officers, 1st Cl.—From the 2nd Cl., and to be temp. Capt.
while so empld.:—Lt. S. A. Laird, Spec. Res., Feb. 12th. Sec.
Lt. (temp. Lt.) P. M. Thesiger, Yeo., T.F.; Sec. Lt. (temp. Lt.)
A. Hunter, W. Rid. R., May 1st.

KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.

His Majesty the King has been graciously pleased to approve of the appointments of the following officers to be Companions of the Distinguished Service Order in recognition of their gallantry and devotion to duty in the field:—

Capt. William Avery Bishop, Can. Cav. and R.F.C.

While in a single-seater he attacked three hostile machines, two of which he brought down, although in the meantime he was himself attacked by four other hostile machines. His courage and determination have set a fine example to others.

Temp. Sec. Lt. (temp. Capt.) Gilbert Ware M. Green, M.C., R.F.C.

He has set a magnificent example by his gallant conduct in attacking the enemy's aeroplanes when in superior numbers. He brought down three enemy machines within 24 hours.

* * *

His Majesty the King has been graciously pleased to award a Bar to the Military Cross to the following officer:—

Temp. Sec. Lt. Charles Thornton Cleaver, M.C., Gen. List, and R.F.C.

When flying at a low altitude, on reconnaissance patrol, he was wounded in the arm. He continued flying for some time, gaining most valuable information. On landing he insisted on being taken to Headquarters to impart the results of his reconnaissance. (M.C. gazetted Oct. 20th, 1916.)

* * *

His Majesty the King has been graciously pleased to confer the Military Cross on the following officers in recognition of their gallantry and devotion to duty in the field:—

Sec. Lt. Douglas John Bell, R.F.C., Spec. Res.

For conspicuous gallantry and devotion to duty when in command of a long-distance bomb raid. Owing to his good leadership and skill a large ammunition dump was destroyed. Later, he single-handedly carried out a difficult mission and succeeded in reaching his objective under extremely adverse weather conditions.

Temp. Sec. Lt. (temp. Capt.) Beauchamp St. John Boulton, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty while on contact patrol. He descended to a height of 400 ft. and attacked a large party of the enemy. He subsequently effected a safe landing, in spite of very adverse weather conditions. He has on many previous occasions done fine work.

Sec. Lt. Edwin Stewart Travis Cole, R.F.C., Spec. Res.

On one occasion he, in a scout, attacked and brought down an enemy two-seater biplane. He has brought down two hostile balloons. He has at all times set a splendid example of courage and initiative.

Temp. Sec. Lt. Harold Eborall Davis, Gen. List and R.F.C.

He carried out a valuable reconnaissance of the enemy lines, flying for half an hour at a height of 500 ft. Although attacked by five hostile machines he succeeded in completing his task, effecting a safe landing. He was himself badly burnt, but rendered a valuable report.

Temp. Sec. Lt. Herbert George Downing, Gen. List and R.F.C.

For consistent skill and gallantry as an observer. On one occasion when on patrol, by holding his fire until within very short range and by skilful co-operation with his pilot, he succeeded in shooting down two hostile machines.

Temp. Sec. Lt. Henry Ernest Karslake Eccles, Gen. List and R.F.C.

He has shown great skill and gallantry in carrying out night raids on the enemy lines. He has also caused material damage to enemy railways while flying at a low altitude.

Temp. Sec. Lt. Archibald Cecil Heaven, Gen. List and R.F.C.

For conspicuous gallantry and devotion to duty when acting as an observer. On one occasion when his pilot was wounded, he steered the machine back, and landing in front of our front lines, he assisted his pilot into a shell hole, and eventually into our own trenches, under continuous rifle fire.

[Temp. Sec. Lt. William Lewis Hughes, Durh. L.I.

He behaved in a most gallant manner when one of our aeroplanes fell in front of our lines. He went out to the assistance of the wounded observer, and under heavy rifle fire succeeded in bringing him into our lines.]

Sec. Lt. (temp. Capt.) Norman George McNaughton, Gen. List and R.F.C., Spec. Res.

For conspicuous gallantry and devotion to duty when acting as patrol leader in numerous combats. On one occasion he led his formation against an enemy patrol, and himself drove down two hostile machines. He has set a fine example of courage and skilful leadership.

Temp. Lt. Thomas George Poland, E. Surr. R. and R.F.C.

He has frequently shown great courage and initiative in attacking the enemy on the ground with machine-gun fire. To carry out this work, he has often flown at very low altitudes, and his machine has been under very heavy machine-gun and rifle fire.

Lt. (temp. Capt.) Bernard Curtis Rice, Gen. List and R.F.C.

While flying at a low altitude he located several enemy batteries. He was attacked by enemy machines, and although under heavy fire from the ground succeeded in driving them off. He has on numerous occasions obtained the most valuable information.

Temp. Capt. George Samuel Sanson, R.F.C., Spec. Res.

Although attacked three times by hostile aircraft, he remained in the air with his balloon at its maximum height, and completed his task. He has on many previous occasions done fine work.

Lt. Victor Henry Huston, Canadian A.S.C. and R.F.C.

He has rendered valuable service when on photographic reconnaissance. He has always shown the greatest skill and courage in leading attacks on hostile machines, and thus enabling valuable photographs to be secured behind the lines.

* * *

His Majesty the King has been graciously pleased to approve of the award of the Distinguished Conduct Medal to the following non-commissioned officer and man, for acts of gallantry and devotion to duty in the field:—

24107 Flt. Sgt. G. G. L. Blake, R.F.C.

65935 2nd Cl. Air Mech. L. H. Emsden, R.F.C.

* * *

His Majesty the King has been graciously pleased to award the Meritorious Service Medal to the following in recognition of valuable services rendered with the Armies in the field during the present war:—

2197 Flt. Sgt. F. Batty, R.F.C.

FROM THE COURT CIRCULAR.

BUCKINGHAM PALACE, June 13th.

The following Officer had the honour of being received by the King this morning, when His Majesty invested him with the Insignia of the Order into which he has been admitted.

THE DISTINGUISHED SERVICE ORDER.

Lieut.-Colonel George Hynes, R.A. and R.F.C.

The King then conferred decorations as follows:—

THE MILITARY CROSS.

Major Robert Cherry, R.A. and R.F.C.

Major Cuthbert Hiatt, Norfolk Regt. and R.F.C.

Capt. Hubert Le Jeune, R.F.C.

Capt. Frank Shirley, Yorkshire Regt. and R.F.C.

Lieut. Allan Denison, York and Lancaster Regt. and R.F.C.

Lieut. Arthur Styran, R.F.C.

NAVAL.

The following appointments have been made in the Royal Naval Air Service:—

JUNE 13th.—Late Lt. (Temp. R.N.V.R.).—C. S. Donnelly, granted a temp. commission as Lt.-Comdr. (R.N.V.R.), seny. June 12th.

JUNE 14th.—Chapl. and Naval Instr.—Rev. T. W. Robinson, B.A., to the Royal Naval Hospital, Great Yarmouth, and for R.N. Air Station, to date July 17th.

JUNE 14th.—Lt. (temp., R.N.V.R.).—C. Harrison, to "President," for Crystal Palace, June 10th.

ADMIRALTY COMMUNIQUÉS.

JUNE 14th.—Zeppelin L43 was destroyed this morning by our Naval Forces in the North Sea.

Soon after being attacked she burst into flames fore and aft, broke in two, and fell into the sea.

No survivors were seen.

JUNE 15th.—A squadron of R.N.A.S. machines bombed the St. Denis Westrem (four miles south-west of Ghent) aerodrome this morning.

A large number of bombs were dropped on the objective.

Very good shooting appears to have been made; many direct hits were observed, from which dense columns of smoke and flames were seen to arise.

All our machines returned safely.

THE CASUALTY LIST.

Reported June 14th.

ACCIDENTALLY KILLED.—Parry, Prob. Flt. Officer W. G., R.N.

ACCIDENTALLY INJURED.—Coleman, Flt. Lt. J. P., R.N.

Howard, Prob. Flt. Officer A., R.N.

Reported June 15th.

ACCIDENTALLY KILLED.—Shearer, Flt. Sub-Lt. T. R., R.N.

DIED OF WOUNDS.—Stuart, Prob. Flt. Officer K., R.N.

Reported June 18th.

MISSING.—Smith, Flt. Sub-Lt. L. F. W., R.N.

PREVIOUSLY REPORTED MISSING, NOW UNOFFICIALLY REPORTED KILLED.—Ellis, Flt. Sub-Lt. O. B., R.N.

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KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.

KILLED.—Shepard, A. L., Aircraftmn., 2nd Gde., F.17635.
DIED OF INJURIES ACCIDENTALLY SUSTAINED.—Creasy, W., Air
Mech. 2nd Gde., F.21467.

PERSONAL NOTICES.

DEATHS.

LOMER.—Lieut. Horace Clifford Lomer, R.N.D., attached R.F.C., killed in action on May 5th, was the only son of Horace Arthur Lomer, of Invermark, Elmbourne Road, S.W., and was 27 years of age. He was educated at Dulwich College, and joined the R.N.D. in November, 1914, receiving his commission in January 1915. He transferred to the R.F.C. last August, obtained his wings in December, and left for the front on January 10th.

His commanding officer writes:—"It is a very great loss to us to lose your boy. He was liked by everyone, and the men in the squadron hold him very highly in esteem. He worked hard with the men's concert party, and got it to a pitch almost perfect. . . . His machine was hit by anti-aircraft fire, and came down with a spin in our lines; he was flying at a height of 8,000 ft."

A comrade writes:—"Your son did a very great deal to help officers and men to keep up their spirits and forget the war for a while, and that was no small service. The flight and squadron have to mourn the loss of a gallant officer and well-loved comrade."

MAXWELL.—Flt. Sub-Lieut. John Earle Maxwell, R.N.A.S., who is now reported to have been killed on March 30th, 1917, after having been previously reported missing, was the elder son of Mr. and Mrs. J. A. Maxwell, of 84, Dartmouth Road, Brondesbury, N.W. He was educated at Haileybury, and was a student at Guy's Hospital at the outbreak of war. He obtained a commission in the R.N.V.R., and was attached to the R.N.A.S. as an observer, and his machine was shot down in Bulgaria. He was a Fellow of the Royal Astronomical Society and a member of the British Astronomical Society and other scientific societies.

PARRY.—The jury returned a verdict of accidental death, at Edmonton, on the body of Probationary Flight Officer William George Parry, aged 26, of Westcliff. He was learning how to land, and when the machine was about 300 ft. high it suddenly nose-dived to the ground. It was suggested that he had not heard the instructions given to him.

STUART.—Probationary Flight Officer Kenneth Stuart, aged 18, of Thicket Road, Anerley, who was thrown out of his machine in landing, had been flying at an Essex aerodrome, and was two seconds too late in "flattening out" the aeroplane—an error to which, it was said, even an expert was liable. In consequence the nose of the machine struck the ground. A verdict of accidental death was returned.

ENGAGEMENT.

ARNOLD—FREWER.—The marriage between Flt. Lt. Harwood Arnold, D.S.O., R.N., and Miss Frewer will take place quietly at St. Patrick's, Hove, on Monday, July 2nd, at 1.30 p.m. No invitations will be issued, but all friends will be welcome at the ceremony.

MARRIAGE.

WATERLOW—CLARE.—On June 9th, at Farnham Parish Church, Lieut.-Colonel and Wing Commander Clive Maitland Waterlow, R.E. and R.N.A.S., was married to Joan, younger daughter of Mr. and Mrs. Clare, Farlands Croft, Farnham.

BIRTH.

BREESE.—On Friday, June 8th, at the Priest's House, Wel-lingore, the wife of Squadron Commander Charles Dempster Breese, R.N., of a son.

In the Royal Naval Air Service boys are required for training as wireless telegraphists. Entry is for three months' probation and after for the period of hostilities. 50 per cent. will be allowed transfer to permanent service. Candidates must be between the age of 17 years and 17 years 6 months, and must be prepared to carry out flying duties in any type of aircraft at home or abroad. Pay is 1s. per day and all found to age of 18, then pay of men's ratings. It is stated officially that application should be made in writing, stating the exact date of birth, to N.4 Section, Room 493a, Hotel Cecil, Strand, W.C.2.

[One has been under the impression, for some time, that the Hotel Cecil no longer exists, but is now known officially as the Air Board Office, and by no other name.—Ed.]

MILITARY.

G.H.Q. COMMUNIQUÉS.

JUNE 12th, 9.9 p.m.—Our aeroplanes were active yesterday, although weather conditions were not favourable, and much useful work was accomplished.

One of our machines is missing.

JUNE 13th, 9.5 p.m.—Our aeroplanes continued to carry out useful work yesterday.

In air fighting, three German aeroplanes were brought down

and two others were driven down out of control. Another hostile machine was shot down in our lines by our anti-aircraft guns.

All our machines returned safely.

JUNE 14th, 8.52 p.m.—In air fighting yesterday, one German aeroplane was brought down and three others were driven down out of control.

None of our machines are missing.

JUNE 15th, 8.50 p.m.—Four German aeroplanes were brought down yesterday in air fighting and three others were driven down out of control.

Two of our machines failed to return.

JUNE 16th, 9.10 p.m.—Many air fights took place, in which large number of machines were engaged on either side.

As a result of the fighting, six German aeroplanes were brought down, one of which fell in our lines, and 10 other enemy machines were driven down out of control.

Our losses for the day are one machine missing.

JUNE 17th, 9.1 p.m.—There was great activity in the air again yesterday.

Seven German aeroplanes were brought down in air fighting, two of which fell in our lines, and three other enemy machines were driven down out of control.

Two of our aeroplanes are missing.

JUNE 18th, 8.47 p.m.—Yesterday fighting in the air again went in our favour. Ten German machines were brought down by our aeroplanes and five others were driven down out of control.

Two of our aeroplanes failed to return.

* * *

The following is contained in a message of congratulation from Field-Marshal Sir Douglas Haig to the General Officer Commanding the Second British Army after the victory of the Messines Ridge and has been published as a general Order of the Day—dated June 12th:—

"I desire to place on record here my deep appreciation of the splendid work done above and below ground, as well as in the air, by all arms, services, and departments, and by the Commanders and Staffs by whom, under Sir Herbert Plumer's orders, all means at our disposal were combined, both in preparation and in execution, with a skill, devotion, and bravery beyond all praise."

* * *

WAR OFFICE COMMUNIQUÉ.

JUNE 13th.—The G.O.C. the British Forces in Macedonia reports:—

During the past week our aeroplanes have bombed Angista Station and hostile camps at Savjak (2½ miles north-north-east of Prosenik), Marinopolje, and Puljovo (Upper Struma Valley).

* * *

HOME COMMAND COMMUNIQUÉS.

JUNE 13th, 12.30 p.m.

About 15 hostile aeroplanes were heard crossing the Essex coast, passing in the vicinity of the Nore, about 11 a.m.

They proceeded in the direction of London, separating when they had covered about half the distance.

The East-end of London has been attacked and bombed, but no reports have yet been received of casualties or damage done.

The anti-aircraft guns of the London defences have been in action, and a large number of aeroplanes are still up in pursuit.

5 p.m.

In continuation of this morning's communiqué, the first bombs were dropped on the eastern outskirts of London at about 11.30 a.m.

Numerous bombs fell in rapid succession in various districts in the East End.

One bomb fell in a railway station, hitting an incoming train. Seven persons were killed and 17 injured here.

Another bomb fell on a school, killing 10 and injuring about 50 children.

A number of warehouses were damaged and fires caused.

Up to the present the casualties reported in the London area are 41 killed and 121 injured. The lists are at present incomplete, and the final figures may be greater.

A few bombs were also dropped near the North Foreland, and on the opposite banks of the Thames, four persons being injured.

The air raid over London lasted about 15 minutes.

The raiders were engaged by the guns of the East London defences, and a large number of aeroplanes of the Royal Flying Corps and Royal Naval Air Service were sent up as soon as the enemy was reported off the coast.

Several engagements took place in the air, but the results are at present uncertain.

11.30 p.m.

Latest police reports show that the casualties so far reported in to-day's air raid are:—

KILLED.		INJURED.	
Men	55	Men	223
Women.....	16	Women.....	122
Children	26	Children	94
Total.....	97	Total.....	439

No damage of a military or naval nature was done.

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KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.

JUNE 17th, 4.10 a.m.—Early this morning some enemy airships approached the East and South-East coast.

At about 2 a.m. two airships came a short distance inland, one crossing the East Anglian coast, the other coming over Kent for a few minutes.

Bombs are reported to have been dropped by the latter ship. Some damage was done, and a fire broke out in a coast town. No further details are yet to hand.

LATER.—One Zeppelin was brought down in flames.

4.0 p.m.—In continuation of the communiqué issued at 4.10 a.m. this morning,

Last night's raid was carried out by two enemy airships.

One airship crossed the Kentish coast at about 2.0 a.m., and dropped six bombs on a coast town.

The latest police reports state that two persons were killed and 16 injured. A large number of houses was damaged.

The second raider made an attack on a coast town of East Anglia at about 2.30 a.m. She was heavily shelled by the guns of the anti-aircraft defences, and was driven off. It is probable that she was damaged by gunfire. Shortly afterwards this raider, after dropping a number of bombs in open places, was engaged and brought down in flames by a pilot of the Royal Flying Corps.

The airship was destroyed.

No casualties or damage were caused in East Anglia.

THE CASUALTY LIST.

Reported June 13th.

KILLED.—Griffiths, Lt. G. A. Welsh R., attd. R.F.C.

DIED OF WOUNDS.—Baines, Sec. Lt. G., Middx. R., attd. R.F.C.

WOUNDED.—Gunner, Sec. Lt. H. W., R.F.C.

Mansbridge, Sec. Lt. L. M., Dorset R., attd. R.F.C.

Martin, Lt. F. J., R.F.C.

Penberthy, Sec. Lt. E. H., Lond. R. and R.F.C.

Rodgers, Sec. Lt. G., D. of Well. R. and R.F.C.

MISSING.—Fletcher, Sec. Lt. G. H., W. York. R., attd. R.F.C.

Foster, Sec. Lt. F. H., R.F.C.

Haller, Sec. Lt. E. D., R.F.C.

McNamara, Sec. Lt. J. C., R.F.C.

Neill, Sec. Lt. R. M., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND PRISONERS IN GERMAN HANDS.—George, Lt. H. D. K., R. Dub. Fus., attd. R.F.C.

Leckler, Sir Lt. A. N., R.F.C.

Boldison, Sec. Lt. A., Lincoln R., attd. R.F.C.

PREVIOUSLY REPORTED PRISONERS, NOW REPORTED WOUNDED AND PRISONERS IN GERMAN HANDS.—Fairbairn, Sec. Lt. J., R.F.C.

Middleton, Lt. J. R., R.F.C.

WOUNDED AND PRISONER IN TURKISH HANDS.—Maguire, Sec. Lt. M. L., Conn. Rang., attd. R.F.C.

DIED OF WOUNDS.—R.F.C.—Gladman, 50421 2nd Cl. Air Mech. T. (Willesden, N.W.).

Reported June 14th.

KILLED.—Bottomley, Sec. Lt. E. R., R.F.A. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Headley, Sec. Lt. H. M., R.F.A., attd. R.F.C.

Wood, Sec. Lt. T., R.F.C.

DIED OF WOUNDS.—Inglis, Sec. Lt. S. H., R.F.C.

WOUNDED.—Bolam, Sec. Lt. W. H., K.R.R.C., attd. R.F.C.

Briscoe, Lt. R. L., S. Lanc. R. and R.F.C.

Chadwick, Capt. G., Manch. R. and R.F.C.

Herbert, Lt. F. L. B., R.F.A., attd. R.F.C.

Ley, Sec. Lt. C. F. A., Yeo. and R.F.C.

Light, Sec. Lt. A. D., R.F.C.

Southey, Sec. Lt. W. A., R.F.C.

MISSING.—Gee, Sec. Lt. G. R. D., R. Surr. R., attd. R.F.C.

Harley, Lt. F. W., Black Watch and R.F.C.

Paton, Sec. Lt. H. F., R.F.C.

Steeves, Sec. Lt. D. T., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND PRISONER IN GERMAN HANDS.—Cooper, Lt. H. A., Lond. Regt. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Burrill, Lt. T. F., Yeo. and R.F.C.

Holland, Sec. Lt. C. B., R.F.C.

KILLED.—R.F.C.—Pawley, 25679 2nd Cl. Air Mech. G. (Fakenham).

ACCIDENTALLY KILLED.—R.F.C.—Nell, 36202, 2nd Cl. Air Mech. P. M. (Kandy, Ceylon).

Reported June 15th.

KILLED.—Williams, Sec. Lt. R. V., R.F.C.

DIED OF WOUNDS.—Stevenson, Sec. Lt. W. H., R.F.C.

WOUNDED.—Corner, Sec. Lt. W. G., L'pool R., attd. R.F.C.

Green, Sec. Lt. T. L., R.F.A., attd. R.F.C.

Harrison, Sec. Lt. R., Hamp. R., attd. R.F.C.

Sclater, Sec. Lt. T. W., Lond. R. and R.F.C.

MISSING.—Allcock, Capt. W. T. L., R.F.C.

Harris, Sec. Lt. H., R.F.C.

Honer, Lt. D. J., R.F.A. and R.F.C.

Pixley, Capt. R. G. H., M.C., R.F.A. and R.F.C.

KILLED.—R.F.C.—Magee, 6187 1st Cl. Air Mech. D. L. (Liverpool).

DIED OF WOUNDS.—R.F.C.—Hodge, 49795 2nd Cl. Air Mech. S. J. G. (Cricklewood, N.W.).

CANADIAN CONTINGENT.—WOUNDED.—Leishman, Lt. G. E., Cent. Ont. R., attd. R.F.C.

MISSING.—Metherall, Lt. T. A., Sask. R., attd. R.F.C.

Sutcliffe, Maj. C. E., Canadian, attd. R.F.C.

Reported June 16th.

KILLED.—Arbery, Sec. Lt. E. E., R.F.C.

DIED OF WOUNDS.—Sawden, Lt. W. W., R.G.A. and R.F.C.

WOUNDED.—D'Arcy, Sec. Lt. Hon. S. H. A., R.F.C.

Gaynor, Sec. Lt. J. J., R.F.A., attd. R.F.C.

Girvan, Sec. Lt. C. C. J., Lanc. Fus., attd. R.F.C.

Neville, Sec. Lt. L. R., R.F.C.

MISSING.—Baylis, Sec. Lt. C. J., R.F.C.

Chalmers, Sec. Lt. B. G., Gordon Highrs. and R.F.C.

Cotterill, Lt. H. G. K., R.F.A., attd. R.F.C.

Devenish, Lt. G. W., R.F.A., attd. R.F.C.

Grevelink, Lt. E. J. Y., D. of Well. R., attd. R.F.C.

Grierson, Sec. Lt. C. D., Yeo. and R.F.C.

Jackson, Lt. J. B., R. Scots, attd. R.F.C.

Jacot, Sec. Lt. E., R.F.C.

Rutter, Capt. D. C., R. Sussex R., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED WOUNDED AND PRISONER IN GERMAN HANDS.—Jay, Sec. Lt. T. W., R.F.C.

PREVIOUSLY REPORTED PRISONER, NOW REPORTED WOUNDED AND PRISONER IN GERMAN HANDS.—Greig, Capt. O., R.F.C.

PREVIOUSLY REPORTED WOUNDED AND MISSING, NOW REPORTED PRISONER IN BULGARIAN HANDS.—Hyde, Sec. Lt. E. P., Ches. R. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Baerlein, Sec. Lt. A. A., R.F.A., attd. R.F.C.

Bowers, Lt. P. T., R.F.C.

Cairns, Sec. Lt. J. A., A. and S. High. and R.F.C.

Fereman, Sec. Lt. A. E. Middx. R., attd. R.F.C.

Hamilton, Lt. W. N., R.F.C.

Hawkins, Capt. H. R., R.F.C.

Jennings, Sec. Lt. E. D., R.F.C.

Lingard, Sec. Lt. J. R., Ches. R., attd. R.F.C.

McEntee, Sec. Lt. G. O., R. Fus., attd. R.F.C.

Milling, Lt. H. B., R.F.C.

Paris, Lt. D. K., M.C., R.F.A., attd. R.F.C.

Price, Sec. Lt. H. J., R.W. Surr. R., attd. R.F.C.

Richards, Sec. Lt. H. S., Sher. For., attd. R.F.C.

Wills, Sec. Lt. S. T., North'n R., attd. R.F.C.

CORRECTION.—WOUNDED.—Johnson, Lt. R. E., Queen's (R.W. Surr. R.), attd. R.F.C., should read:—

Johnson, Lt. R. E., R.F.C.

Reported June 18th.

KILLED.—Cumming, Sec. Lt. A. L., R.F.C.

Harris, Sec. Lt. R. M., Yorks R., attd. R.F.C.

MacGregor, Sec. Lt. T. C. S., High. L.I., attd. R.F.C.

Spooner, Sec. Lt. R. W., R.F.C.

DIED OF WOUNDS.—Prior, Capt. L. P., Lond. R. and R.F.C.

WOUNDED.—Bowman, Lt. L. S., R. Lanc. R. and R.F.C.

Brown, Sec. Lt. F. P., R.F.C.

Conder, Sec. Lt. R. E., R.F.C.

Hamel, Sec. Lt. E. B., R.F.C.

Latta, Capt. J. D., M.C., R.F.C.

Leake, Lt. E. G., Manch. R. and R.F.C.

Morgan, Sec. Lt. R. C. W., S. Wales Bord., attd. R.F.C.

Newling, Lt. P. T., R.F.C.

Powell, Sec. Lt. R. A. W., Suff. R., attd. R.F.C.

Wallington, Sec. Lt. F. V., M.C., R.F.C.

Wenger, Lt. N. J., Yeo. and R.F.C.

Wells, Lt. H. E., R.F.A., attd. R.F.C.

Williamson-Jones, Le. C. E., Manch. R., attd. R.F.C.

Wilson, Sec. Lt. J. R., R.F.C.

WOUNDED AND MISSING.—Clarke, Sec. Lt. H. Y. C., R.F.C.

MISSING.—Di Balme, Sec. Lt. Count L. T. B., R.F.C.

Boote, Sec. Lt. R. S. L., R.G.A. and R.F.C.

Davies, Sec. Lt. G. A. H., Mon. R. and R.F.C.

Dobson, Sec. Lt. A. E. J., R.F.C.

Durkin, Sec. Lt. F. V., Worc. R. and R.F.C.

Ferriman, Lt. F. S., Oxf. and Bucks L.I., attd. R.F.C.

Hair, Sec. Lt. N. B., R.F.C.

Illingworth, Sec. Lt. F. W., Sco. Rif., attd. R.F.C.

Marsh, Sec. Lt. R. M., R.F.C.

Milliship, Sec. Lt. W. G., R.F.C.

Mitchell, Lt. A. P., Midlx. R. and R.F.C.

Pollard, Sec. Lt. G. H., A. and S. High. and R.F.C.

Phillippo, Lt. A. J. C. E., A.S.C., attd. R.F.C.

Robertson, Sec. Lt. A. G., Black Watch and R.F.C.

Shaw, Lt. J. W., R.F.C.

Slee, Sec. Lt. F. D., R.F.C.

Smith, Lt. B., Essex R. and R.F.C.

Stead, Sec. Lt. G. C., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Hopkins, Sec. Lt. G. M., R.F.C.

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KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.

Reported June 19th.

KILLED.—Green, Sec. Lt. C. L., Essex R., attd. R.F.C.
Halliday, Sec. Lt. M. F. J., Glouc. R., attd. R.F.C.
Jackson, Capt. H., R.F.C.

WOUNDED.—Browne, Sec. Lt. A. D. C., R.F.C.
Dixon, Sec. Lt. R. M., R. Berks R., attd. R.F.C.
Lascelles, Sec. Lt. E. H., K.R.R.C., attd. R.F.C.
Robins, Sec. Lt. E. K., E. Surr. R., attd. R.F.C.
Speller, Sec. Lt. L., R.W. Surr. R. and R.F.C.

MISSING.—Hamer, Lt. H., R.F.C.
Mussared, Sec. Lt. W. J., R.F.C.
Sharpe, Lt. F., Sher. F., attd. R.F.C.
Shirley, Sec. Lt. A. V., Yeo. and R.F.C.

PERSONAL NOTICES.

DEATHS.

BENTHAM.—Sec. Lt. C. Andrew Bentham, East Surrey Regt. and R.F.C., who was reported missing on Nov. 3rd, 1916, and whose death is now officially presumed, was the eldest son of Mr. and Mrs. H. Bentham, of Ritherdon Road, Upper Tooting, S.W. He was educated at Monkton Combe School, near Bath, and immediately on the outbreak of war enlisted in the Fusiliers. Given a commission in the East Surrey Regt., he afterwards transferred to the R.F.C. It was while flying over the Somme that his machine was seen to be shelled and came down apparently out of control.

BONNER.—Sec. Lt. Austin Bonner, South Staffs Regt., attd. R.F.C., was the younger son of the late Rev. Henry Bonner, minister of Hamstead Road Baptist Church, Birmingham. He was educated at King Edward's High School and afterwards became a student at the Birmingham School of Art. He enlisted in a Birmingham City Battalion of the Royal Warwickshire Regt. in August, 1914, and later obtained a commission in the South Staffs Regt. He was wounded in the spring of 1916, and returned to the front in the following Sept. In Dec. he was attd. to the R.F.C. as an observer, and was killed in an engagement with a hostile machine on April 30th. He was 20 years of age.

BROWNING.—Capt. Stanley Forrester Browning, R.F.C. second son of Mr. and Mrs. B. F. Browning, Rutleigh, Furze Lane, Purley, was killed in action on May 3rd. He was 21 years of age.

CARTER.—Lt. Frank Leslie Carter, East Surrey Regt., attd. R.F.C., was killed in action on April 22nd. He was 21 years of age.

CHARLESWORTH.—Sec. Lt. A. T. B. Charlesworth, R.F.C., whose death was announced last week, was only son of Mr. and Mrs. A. L. T. Charlesworth, of Victoria, B.C. He was 24 years of age, and received his commission on March 17th of this year.

Mr. Charlesworth was born in 1893 and educated at Christ's Hospital, where he was a member of the Cadet Corps. Leaving school in 1909, he went to British Columbia, and joined his father in fruit-farming. On the outbreak of war he enlisted in the Canadian Contingent, and soon became Corporal. He received his commission in the R.F.C. last March, and had been in much of the heavy fighting at the front.

CLARKE.—Sec. Lt. Nat. F. Clarke, R.F.C., late of Colonel, Chile, who was accidentally killed while flying on June 1st, was the elder son of Mr. and Mrs. Edward Clarke, Enderwood, Four Oaks, and husband of Anita Clarke, 169, Oakwood Court, Kensington.

FINDLAY.—Capt. Lorimer Findlay, R.F.C., of Bowes Park, London, was killed on June 15th, while flying on the East Coast of Scotland, owing to his machine being blown out of control in a strong wind.

FOSTER.—Sec. Lt. Frank Hawley Foster, who was unofficially reported killed during an offensive over the enemy's line on June 3rd, was the elder son of Mr. and Mrs. A. J. Foster, 5, Denver Road, Stamford Hill, London, N.

GEESON.—Sec. Lt. Leslie Frank Geeson was fatally injured at an aerodrome in the East Coast district.

GEORGE.—Lieut. H. D. K. George, Royal Dublin Fusiliers, attached to R.F.C., who was previously reported wounded and a prisoner of war, is now reported to have died. He was the only son of Duncan and Mrs. George, of 7, Stanhope Terrace, Hyde Park. He was aged 19.

GREEN.—Sec. Lt. Charles Layton Green, Essex Regt., attd. R.F.C., who was killed in action on June 9th, was the elder son of Dr. and Mrs. Green, Woodside, S.E. He was 24 years of age.

JESSOPP.—Lt. Augustus John Jessopp, R.F.C. (formerly Bedfordshire Regt.), who was killed in action on May 12th, was the elder son of Mr. and Mrs. Walter B. Jessopp, of Bedford. He was 22 years of age.

MACGREGOR.—Sec. Lt. T. C. S. MacGregor, H.L.I., R.F.C., who was killed in action on June 8th, was the youngest son of Mr. and Mrs. W. O. MacGregor, Hazaribagh, India. He was aged 20.

MARTINSON.—Sec. Lt. K. L. Martinson, R.F.A., attached R.F.C., who died of wounds on June 1st, was the only son of Mr.

and Mrs. A. L. Martinson, of 8, Carlton Gardens, Herne Bay, Kent. He was aged 20.

MOORE.—Captain Beaufoi John Warwick Montressor Moore, M.C., R.F.C., who was killed in a flying accident on June 10th, joined the R.F.C. in 1914. He was an electrical engineer, having served his time in the works of Messrs. J. C. Fuller and Son, electrical and telegraph engineers, of Woodland Works, Chadwell Heath. He was a member of the Institute of Electrical Engineers. About the time of the outbreak of war he returned from Canada, where he had been engaged on important electrical undertakings, and at once offered himself for service.

He was refused a commission on medical grounds, Lt. joined the R.F.C. as a first-class air mechanic. Within a few months he received his commission and pilot's certificate, and shortly afterwards went to the front. There he remained for about twelve months, during which time he was recommended for the Military Cross, which he eventually received at the hands of the King at Buckingham Palace on February 14th last. Early this year he was recalled, having been selected to give instruction in the manoeuvring of the latest types of aircraft, and it was while carrying out these duties that he was killed.

STEPHEN.—A verdict of accidental death was returned at an inquest held at York on June 14th on the body of Lt. Llewellyn Stephen, of the R.F.C., who was killed on June 12th while flying in West Yorks. A witness said he saw the machine about 200 ft. up, when something appeared to go wrong with the engine. It finally dived straight to earth, and when he went to the spot he found the deceased lying unconscious by the machine, which was much damaged. An ambulance was sent for, and the deceased was removed, dying on the way to York. The deceased lived at Kingston-on-Thames.

TEW AND SAVAGE.—Two R.F.C. officers, Lt. P. Tew (the pilot) and Lt. Savage (the observer), were killed by the fall of their machine on June 17th.

THOMSON.—Sec. Lt. Wardlaw Ivor Thomson, R.F.C., who was killed on June 6th as the result of an aeroplane accident, was the only son of Mr. and Mrs. Wardlaw B. Thomson, Wynberg, Cape Town. He was aged 19 years.

MARRIAGES.

BROCK—CAREY.—On June 9th, at Charlcombe Church, Bath, Lt.-Col. Henry de Marchant Brock, D.S.O., Royal War. Regt. and R.F.C., son of the Rev. H. Walter Brock, of St. Pierre du Bois, Guernsey, was married to Daphne Fanshawe, elder daughter of Mr. and Mrs. Cecil Carey, of Hauteville, Guernsey, by the Rev. H. L. Maynard, Vicar of Twerton, assisted by the Rev. A. Wright, Rector of Charlcombe.

CASALIS DE PURY—MAJOLIER.—On June 3rd, at St. Mary's, The Boltons, Roger Emile Casalis de Pury, R.F.A. and R.F.C., only son of Lt.-Col. and Mrs. Casalis de Pury, of the South African Ambulance at Cannes, France, was married to Suzanne Honor Majolier, youngest daughter of the late Edouard Majolier and Mrs. Majolier, of Congénies (Gard), France, and 20, Bramham Gardens, S.W., by the Rev. Dr. Rosedale.

GOULD—HEILBRUN.—On June 7th, 1917, Lt. Leslie H. Gould, Canadians, attached R.F.C., only son of Mr. and Mrs. H. Gould, of North Battleford, Sask., Canada, was married to Lilian Edith, elder daughter of Mrs. Heilbrun, and the late Joseph Heilbrun, of Finsbury Park, N., by special licence.

HAWKINS—LACEY.—On June 4th, at All Saints' Church, Highgate, Capt. Robert Henry Hawkins, S. Staff. R., attd. R.F.C., was married to Margaret, eldest daughter of the Rev. T. A. Lacey, Warden of the London Diocesan Penitentiary, Highgate, by the Vicar, the Rev. F. H. A. Hawkins, father of the bridegroom, assisted by the Rev. E. J. Hewlett, Vicar of Christ Church, Clapton.

HIGGINS—TOMKINS.—On June 5th, at St. Luke's, Reading, Capt. James White Higgins, R.F.A., attached R.F.C., second son of Mr. and Mrs. R. C. Higgins, Mannofield, Bearsden, Dumbartonshire, was married to Bertha, youngest daughter of Mr. and Mrs. Henry Tomkins, Reading, by the Rev. F. J. Howard, M.A.

LUCAS—DAVIS.—On June 7th, in London, Lt. Leonard Lucas, Welsh Regt., attd. R.F.C., son of the late George Daniel Lucas, Esq., and Mrs. Lucas, of Shinfield, Berks, was married to Eileen, only daughter of Mr. and Mrs. Lionel Cartwright Davis, Aberdare Gardens, W. Hampstead, and Rosemary, Pangbourne, by special licence.

MILLS—BLAKE.—On the 6th inst., at St. Mary Abbots, Kensington, Capt. R. N. F. Mills (attached R.F.C.), younger son of Mr. and Mrs. Mills, of Taptot Grove, Chesterfield, was married to Marjory Frances, younger daughter of Sir Francis Blake, Bt., M.P., and the late Lady Blake, of Tillmouth Park, Cornhill-on-Tweed and 10, Old Court Mansions, Kensington, W., by the Rev. H. St. B. Holland, M.A.

SAUNDERS—GRAHAM.—On June 6th, at St. Mark's Church, Surbiton, Ferdinand Ward Saunders, Sec. Lt., Welsh Regiment, attached Royal Flying Corps, only son of Ferdinand Saunders,

(Continued on page 1614).



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The British Aircraft Industry.

BY CHARLES L. FREESTON.

XX.—SIR W. G. ARMSTRONG, WHITWORTH & CO., LTD.

It has happened several times, when reviewing the past history of one firm or another in the aircraft industry, that some outstanding incident of many years ago has recalled itself to my mind, having survived in the recollection despite all manner of events of later date and much greater importance.

In the case of Sir W. G. Armstrong, Whitworth and Co., Ltd., of Newcastle-upon-Tyne, retrospection reaches its maximum limit.

When a very small boy, I was living not far from Manchester, and near my home were some sandhills. To these one day was brought an enormous gun, of the "Woolwich Infant" type, and 40 or 50 yards in front of it was propped, against a sandbank, a circular slab of metal about 6 feet in diameter and a foot thick. A bagful of powder and a cylindrical shot, some 18 inches long, with fluted sides, were placed within the gun, which was then fired with a reverberating roar. When the smoke had cleared away the people who had come down with the gun went forward to the circular slab, and anxiously and minutely inspected the nature and extent of the crack which was now visible on its surface.

GUN V. ARMOUR-PLATE.

Like little Kaspar, I asked what it was all about. Well, it was but an incident in the long-drawn duel between the two great houses of Armstrongs in the North and Whitworths in Manchester. As fast as one brought out a new gun with greater penetrative power than any of its predecessors, the other would bring out a new type of armour-plating to beat the gun. The public mind was perpetually in a state of flux. At one period it would be thought that the iron-clad had had its day, because the newest gun could penetrate its armour, and then a new plating would prove superior to the gun—until the next ordnance wonder appeared upon the scene.

When interest in the subject of gun v. armour was at its highest there came the startling announcement that the rival firms had decided to amalgamate, and this ended the duel so far as the public was concerned; whatever was accomplished subsequently in the way of improving either guns or plate was a matter which was only known to experts. But the fusion of the two firms produced a combination which became famous all the world over, and, to the present generation, it has never been known by any other than its present title.

A MANY-SIDED FIRM.

Though building ships and ordnance on a mammoth scale, the Armstrong-Whitworth firm has never despised "sidelines," and was fairly early in the field of motor-car construction, while its entry into the aircraft industry dates from the year 1913. Captain I. F. Fairbairn-Crawford, R.E., who had been principal assistant to the general works' manager at Elswick for a number of years, was entrusted with the formation of the aircraft department and the gathering together of a nucleus staff.

Captain Fairbairn-Crawford is a member of one of the most famous of cricketing families, his father having captained the Kent county eleven at the age of 19, while he himself is an athlete of international distinction. In 1907 he was the half-mile amateur champion, and in 1908 was England's first string in the Olympic 800 metres race.

REPAIRING A FARMAN.

His interest in aviation began in 1910, when he was a starter at the Doncaster meeting, and also attended the Bournemouth meeting. He formed the Northumberland Aero Club, which was a co-operative concern, and led, as a matter of fact, to his first practical acquaintance with aeroplane construction. A Farman machine had been acquired, and was flown at a Bank Holiday meeting in 1911 at Beldon by Madame Franck, who smashed it up. It was rebuilt, and the engine was also repaired, at the Elswick works, after which it was sold and sent to Brooklands where it was used as a school machine. The task of getting it south, by the way, was no light one, as the machine was packed in a 40-ft. case, and the railway companies would not touch it. Eventually it was put on board a steamer.



Captain I. F. Fairbairn-Crawford, R.E.

WAR OFFICE CONTRACTS.

At the very time the directors of Armstrong-Whitworth decided to manufacture aircraft, the British Deperdussin Company, from lack of capital, found it necessary to give up business, and the staff were thus left free to go elsewhere. The works' manager and designer, Mr. F. W. Koolhoven, was engaged in a similar capacity at Newcastle-upon-Tyne, and brought with him several foremen and workmen familiar with aircraft manufacture.

The first contract from the War Office was for two B.E.2a biplanes, and these were put in hand and partly built in one of the shops belonging to the Elswick sawmills at Scotswood.

The space allotted, however, was soon found to be inadequate, and the firm took over some large premises on the outskirts of the city, with a small aerodrome alongside, and thus formed the nucleus of the present extensive erecting shops.

Before the initial contract was completed, a further order was received for B.E.2b biplanes, and these in turn gave place to the B.E.2c machines, of which a very large number were turned out. Meanwhile, the aircraft department was growing in size, and it was difficult at that time to obtain the right class of wood-worker, and more particularly of aeroplane erector, for the industry was entirely new in the north of England, and men had to be brought from the south in order to train others.

THE FIRST "A.-W."

Early in March, 1914, the firm produced the first "Armstrong-Whitworth" machine. It was designed by Mr. Koolhoven, and was flown and tested by Mr. Norman Spratt (now Captain, R.F.C., and a prisoner of war in Germany). This machine was a two-seater biplane, of approximately the same dimensions as the B.E.2c, and fitted with a 70-h.p. Renault engine. It was specially designed with the intention of eliminating as far as possible all welding and intricate machine parts. In other words, the object was to embody simplification in every detail, and so produce a machine that could be dismantled and re-erected in a very short time, and also quickly repaired.

A leading feature was the setting of the tail-plane, which was always a tedious operation in the B.E.2c machine, but in the Armstrong-Whitworth the tail-plane could be set to any angle of incidence and handed over in less than 15 minutes. Another distinctive feature was its patent Oleo type under-carriage. The machine was eventually flown to the Central Flying School and officially tested. Its performance compared quite favourably with that of the B.E.2c, and justified the firm in going ahead with machines of their own design.

SATISFACTORY TESTS.

A second and improved machine was produced in which a 90-h.p. R.A.F. engine was fitted. This machine was flown to the Central Flying School at Upavon, and over the test course was pitted against a brand new B.E.2c. The official results showed that the Armstrong-Whitworth was a little the better in every case, while the machines were equally stable and easy to handle; as a consequence the War Office, recognising the fact that there were some good points in the Armstrong-Whitworth, placed immediate orders for a large number of machines.

When war was declared the aeroplane shops of the firm were full of both B.E.2c and Armstrong-Whitworth machines in various stages of completion, and instructions were received from the War Office to extend the buildings and make arrangements for increased production. This was done forthwith, and continuous orders for aeroplanes were promised.

A 50-H.P. SCOUT.

Just about this time a scout biplane was completed. It was designed for an 80-h.p. Gnome, but, unfortunately, the engine could not be obtained, and a 50-h.p. motor had to be fitted instead. Despite its small horse-power, this little machine showed a very fine range of speed and climb, and was first flown by Mr. Koolhoven and afterwards by Mr. (now Captain) B. C. Hucks and several naval pilots. It was not persevered with, however, as no 80-h.p. engine was forthcoming.

On October 13th, 1915, Captain Fairbairn-Crawford, on a Caudron, took his Royal Aero Club Certificate (No. 1897) at Hendon, so that he has practical experience of flying.

THE ENGINE FAMINE.

In the early part of 1915 a serious shortage of the 90-h.p. R.A.F. engine arose, and, like many other manufacturers, the Armstrong-Whitworth firm were brought to a standstill accordingly. They had no fewer than a hundred machines ready and awaiting engines, but all had to be hung from the roof, three or four deep.

At the request of the War Office a large water-cooled Beardmore engine was sent to Newcastle to be fitted, if possible,

into an Armstrong-Whitworth machine in place of the 90-h.p. R.A.F., for which the machine was designed.

This entailed a considerable degree of rearrangement, as the Beardmore was very much larger than the R.A.F., and had to have radiators and water tanks fitted, together with petrol and oil tanks of increased capacity. The engine also stood very high up on its engine bearers, thus restricting the pilot's view ahead, and, owing to no space being available in the fuselage for the petrol and water tanks, these, of necessity, were placed overhead. They were made streamline in shape, and fitted between the two upper planes, the centre section of the top plane being deleted accordingly.

THE PILOT IN FRONT.

The one feature of this machine, which was the forerunner of the present-day design, was the changing round of the positions of the pilot and observer. The former sat immediately behind the engine, while the observer was in the rear cock-pit, and practically every modern fighting machine is now designed on these lines.

Twelve of these machines had been made when a notification was received that the supply of 90-h.p. R.A.F. engines was once more normal, and the arrangement of the pilot in front and observer behind having proved exceedingly popular, the firm were requested to alter all the 90-h.p. type machines, which was done.

SUCCESSFUL MACHINES.

This machine has never looked back, and has been utilised for overseas work and for all home stations, particularly where advanced training for pilots was taking place. It was one of the easiest machines to loop the loop, and owing to its special under-carriage outlasted all other machines for ordinary wear and tear, and for school tuition purposes.

In the summer of 1916 a much larger machine, of greater h.p., was produced, and went very successfully through the official acceptance trials at the Central Flying School and elsewhere. Details of its design may not be given here, but at least the fact may be mentioned that it is being manufactured in very large numbers, and has proved a very popular and easily handled machine, with an excellent range of speed and climb.

NUMEROUS TYPES.

During last year various other types of machine were produced. A big triplane, carrying a pilot and two gunners, was successfully flown by Captain Payne, R.F.C., but owing to its size and weight the type was not repeated. Machines fitted with various new engines were also dispatched southwards by air. A large amount of experimenting took place, and the resulting machines were all flown with success.

EXPANDING BUSINESS.

Last year, also, the firm launched out into other branches of aircraft, and have several large establishments in different parts of the country, employing considerable numbers of men and particularly women workers. In addition, large orders for complete machines and spares of all kinds have been sub-let to firms in the south, whose whole resources are devoted to the requirements of Sir W. G. Armstrong, Whitworth and Co.

More recently changes have taken place in the management, Mr. F. W. Koolhoven having left to take up another appointment. Mr. F. Murphy, late of Hamble River, Luke and Co., Ltd., and the British and Colonial Aeroplane Co., has been appointed assistant manager in charge of the aeroplane works in Newcastle. Captain Fairbairn-Crawford is head manager of the aircraft department, which includes lighter-than-air craft, with Lieut. R. Griffith Lock, R.N. (late Flight Commander, R.N.A.S.), as assistant manager and personal assistant.

GENERAL BRANCKER'S MOUNT.

Finally, it may be mentioned, as significant of the esteem in which the Armstrong-Whitworth machine is held in official quarters, that General Brancker keeps for his own private use a special 90-h.p. "A.-W." biplane, in which he flies all over England on official visits, besides using this means of travel for visiting other centres in France.

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I am a votary—
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Mental agility
I'll bring to bear in a wink:
Electric potential,
Circumferential,
Sparking plugs timed on contact.
For early ignition
On rising compression—
Now just let me think ere we act.

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Adiabatic
(I've seen them laid out on the bench),
The time calculation
Of valve operation—
With instructions all printed in French—

I study and meditate,
I never hesitate,
Daily fresh problems I solve;
Yet a question recurring
My brain-box is stirring—
Why don't the damned engine revolve?

K. W. R.



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The Production of Aeroplanes and their Components

(Continued.)

BY STEPNEY BLAKENEY.

GETTING TO WORK.

Having dealt at considerable length with the outline of the organisation required in any works, in a more or less modified form, for producing aircraft work, we will now assume that orders have been issued by the General Manager to the Works Manager to proceed with the immediate construction of ten tractor biplanes of any ordinary commercial type.

For the sake of getting quick-finished production and deliveries the orders may be issued for two batches of five. The necessary orders having been issued to the Wood Machining Department for the wood to be cut and machined for five complete sets of wood components, the most suitable timber will be carefully inspected and selected from the pile.

BEGINNING THE FUSELAGE.

In this case we will assume that the fuselage is the unit selected for the start. The timber required in this case is spruce, about $1\frac{1}{4}$ in. square tapering down to 1 in. square to form the longerons, the length being about 19 ft.

The spruce selected should preferably have a fine grain, which, when the longeron is in its permanent position, should form vertical laminæ, as it develops the greatest strength in this position, and also adapts itself to the curves or bends required in forming the streamline contour of the fuselage. The wood might also be selected for its cream-like colour, as this coloured wood is generally found to have the qualities required.

SAWING UP.

Having chosen a 3 in. plank with a fine grain of horizontal or vertical laminæ, if possible, the plank can be taken to the circular saw and cut into 17-16 in. battens by 3 in. These will be laid on their 3 in. face, and again cut down the middle into the approximate section or size required, namely, in this case, 17-16 in. by 17-16 in. Cut this way, it will enable the "rift sawn," or vertical, grain (see Fig. 1) to be obtained as required. To make the whole operation clearer the sketches may be referred to. (See Fig. 2.)

The timber having been rough-sawn to size, it may be as well for the Works Inspector to see it before further work is done to it, and satisfy himself about the quality. Assuming this to be

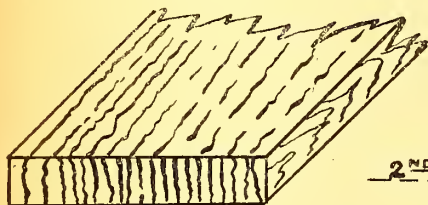
satisfactory, it then may be passed on to the planing machine and have its sides squared to $1\frac{9}{32}$ in., which will be the margin required for shrinkage.

A LONGERON JIG

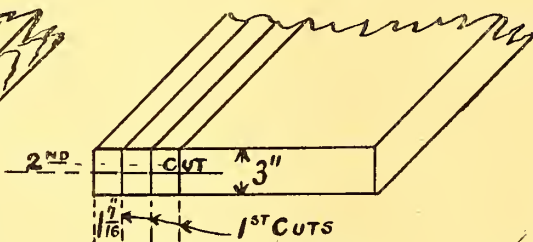
If the foreman of the wood machinists' shop is a quick energetic man, he will now make a simple jig (see Fig. 3) for tapering these battens from $1\frac{9}{32}$ in. at one end to $1\frac{1}{32}$ in. at the other end, in the following manner:—Get a piece of hard wood, about 20 ft. by 6 in. by $\frac{1}{2}$ in. The top and bottom surfaces and one edge of this must be planed true. Next, place the longeron on this hard wood batten and equalise its position on the batten at either end. After having cut the longeron about $1\frac{1}{4}$ in. longer than its correct length, one end should be clamped down at $\frac{1}{4}$ in. from the straight edge of the batten and the other end flush with the edge. Test the straightness of the longeron and fix it with a few additional clamps. Having assured yourself that the longeron has no curves in it, get another piece of hard wood the same length as the longeron, and perfectly true, about 1 in. by 2 in. section, and lay it along the back of the clamped longeron. Then glue and screw it to the hard wood batten and place a cross stop at each end to keep the longeron correctly in its bed in the jig. This jig will then hold the longeron in position when being machined.

Whilst the longeron is being passed across the French vertical spindle, the cutter of which is adjusted to project exactly $\frac{1}{4}$ in., it follows, therefore, that if the edge of the hard wood batten is pressed against the spindle underneath the cutter, commencing at the end where the longeron is $\frac{1}{4}$ in. from the edge, no cutting of the longeron will take place, but as it is slowly pushed past the cutter, the cutter will begin to remove the required amount, continuing to do so until the end of the longeron is reached, which is what is wanted, and the maximum $\frac{1}{4}$ in. at the end is removed.

When the longeron is now measured it will be found to be $1\frac{9}{32}$ in. at one end, tapering to $1\frac{1}{32}$ in. at the other end, which is exactly what is required. Repeat the whole operation on one more side and the longeron will be found to be the correct finished taper, namely, tapering from $1\frac{9}{32}$ in. square down to $1\frac{1}{32}$ in. square.



RIFT SAWN TIMBER
FIG. 1.



CUTTING LONGERONS
FIG. 2.

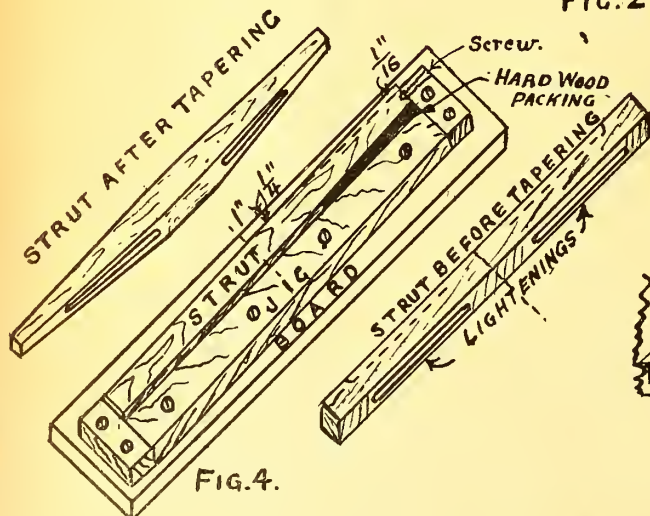
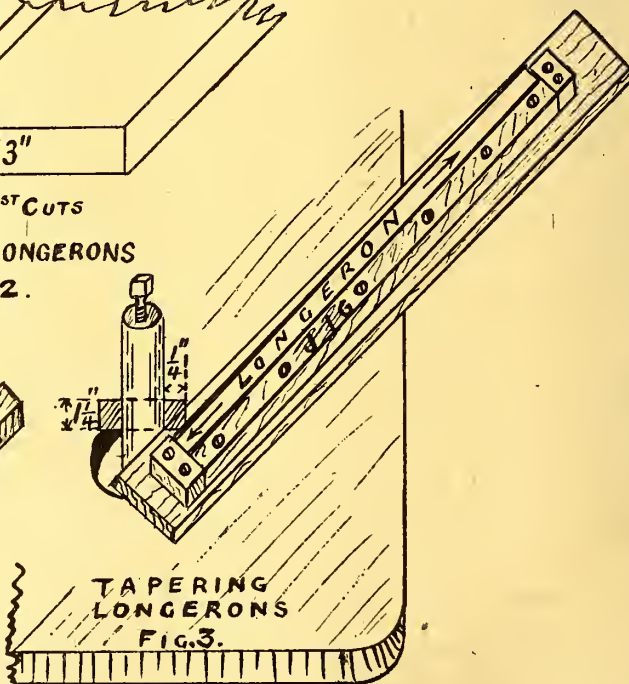


FIG. 4.



NON-POISONOUS
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The longerons can all be worked this way and passed to the inspection department as completed, to be inspected, passed, and stamped ready for issue to the erecting shop, where the longeron will have to be cut in two as the fuselage is built in halves.

FUSELAGE STRUTS.

The next component parts to be considered will be the struts for the fuselage. In accordance with modern theory and design, which we can assume has been adopted, they will be square section, tapering from about 1 in. each side of the centre of the length to the ends on all four sides, and fluted on two sides.

For our purpose we will assume that the lengths vary between 3 ft. by 1 ft. 3 in., and that the centre section is $1\frac{1}{2}$ in. square, diminishing as the rear end of the fuselage is reached to $\frac{3}{4}$ in. square, all tapering at the ends to $\frac{1}{2}$ in. square, where they bed and fit into the steel fittings on the longerons.

The timber for the struts may be cut from any straight grain plank, care being taken to select as far as possible a good fine grain for the long struts. The plank being taken to the circular saw, the required number of pieces of each size are cut, each about $\frac{1}{8}$ in. larger in section than the finished size to allow for planing up to $1/32$ in. above size.

These lengths of timber can now be cut up about 1 in. longer than the finished length and sent to the setter-out, who will, before working on them, submit them for inspection. After they have been passed for quality, the setter-out will find the centre of each and mark off 1 in. each side of the centre of the length. This is where the lightening begins, the lightening being $5/16$ in. deep and $\frac{3}{8}$ in. wide, finishing about $1\frac{1}{2}$ in. from each end of the correct length.

This having been done, they will be taken back to the wood machining department to have the four lightenings (two on each of the two opposite sides) cut out on the spindle.

A STRUT GIG.

The first strut having been completed, it will be at once sent off to the wooden jig maker, who, after carefully consulting the drawing, will at once proceed to make the jig (see Fig. 4) for

holding them whilst they are tapered on the vertical spindle.

This jig will consist of a hard piece of wood about 6 in. longer than the strut, 4 in. wide by $\frac{1}{2}$ in. thick. The centre of this will be carefully squared off, and 1 in. one side of this marked, corresponding to the beginning of the lightenings each side of the centre portion of the strut. Next, lay the strut on the board, with the centre of the strut corresponding to the centre of length marked on the jig board. Set strut back $\frac{1}{4}$ in. from the edge where the lightening begins, and $1/16$ in. from the edge where the correct end of the strut occurs. Clamp the strut firmly in this position, and then fix another piece of hard wood on the inside of the strut, glueing and screwing it to the 4 in. by $\frac{1}{2}$ in. jig board. Cut off the ends true and fix a cross strip across the board with a screw projecting through it horizontally, with the point filed up to a sharp chisel edge. This is for the purpose of gripping the strut in the jig.

TAPERING A STRUT.

The jig now being ready for use, it can be handed to the spindle hand for use. He will take a strut, lay it on the jig, press it against the longitudinal strip, and force the end on to the chisel-pointed screw (see Fig. 4), the cutter in the spindle being about $1\frac{1}{4}$ in. wide, projecting $\frac{1}{4}$ in. On pushing the jig board past the cutter, pressing the jig board against the spindle, the cutter will remove the first side of the taper. This being done, remove the strut, and lay against the longitudinal fixed strip a tapered strip of hard wood packing, corresponding in size to the quantity of wood previously removed by the cutter. This will pack out the strut and enable the cutter to remove the portion on the opposite side.

Two opposite sides are now completed, and all that it is necessary to do is to repeat these operations on the remaining sides at each end and the strut will be finished, all except cutting to the dead length.

The above mentioned operations refer to all struts, the only other difference being that jig boards will be required for each strut of a different length, as the taper varies slightly.

AMERICAN INDUSTRIAL ACTIVITIES.

The Flint Aircraft Company, of Flint, Michigan, is rapidly bringing its organisation to a high state of efficiency, and important developments may be expected shortly. One understands that the directors of the company are in favour of building aeroplanes on European lines, so that something of a new departure in American construction is likely to occur.

The Flint Aircraft Company is in the hands of experienced men associated with general motors, Mr. W. W. Clark, junr., assistant production manager of the Buick Motor Company; Mr. Harry B. Bassett, assistant general manager of the Buick Company; Mr. Sidney S. Stewart, president of the Stewart Body Company, and a number of other automobile manufacturers being interested. A number of experienced aeronautical engineers have been retained, and the fullest advantage will be taken both of American and European experience.

* * *

The Lawson Aircraft Company, of Green Bay, Wisconsin, recently organised by Mr. Alfred W. Lawson, is rapidly approaching the stage when production on a large scale may be expected.

The first factory to be taken over by the Lawson Company, and which is now being used, contains 8,000 square feet of floor space, and 100 workmen are being employed. Buildings on a much larger size are under construction, which will be in operation within three months. By that time 1,000 workmen will be employed.

Mr. Lawson is vice-president of the Company and general manager, and has full powers to operate the factory in the way that seems good to him.

Mr. John Carisi, of Brooklyn, New York, has been engaged as factory superintendent. This gentleman has had 10 years' practical experience of aeroplane construction in different aeronautical factories of the United States. Mr. Lawrence Allison, of Kansas City, Missouri, a graduate of Kansas College of Engineering, has been engaged as chief engineer. He, also, has had 10 years' experience with the Curtiss Company, the Standard Company, and the Burgess Company.

The company is now building three different types of military machines to the specifications of the United States Government, and are also turning out a flying-boat for sporting purposes.

Mr. Lawson has some advanced ideas of his own, which he intends to put into concrete form as soon as time can be found for experimentation.

* * *

Mr. F. H. Russell, the veteran aeroplane manufacturer, manager of the Burgess Co., was elected president of the Aircraft Manufacturers' Association at its regular monthly meeting, which was held on May 9th in the offices of the Association, 501, Fifth Avenue, New York.

The following were present at the meeting: Aeromarine Plane and Motor Corporation, represented by Mr. Inglis M. Uppercu; Burgess Company, represented by Mr. F. H. Russell; the Curtiss Aeroplane and Motor Corporation, represented by Mr. Fay. L. Faurete; L.W.F. Engineering Company, represented by Mr. A. H. Flint; Standard Aero Corporation, represented by Mr. Harry B. Mingle; B. F. Sturtevant Company and the Sturtevant Aeroplane Company, represented by proxy; Thomas-Morse Aircraft Company, represented by Mr. H. B. Morse.

Election of officers was held, and the following were elected: Honorary President, Glenn H. Curtiss; President, Mr. Frank H. Russell, Burgess Company, Marblehead, Mass.; Vice-President, Mr. Albert H. Flint, L.W.F. Engineering Company, College Point, L. I.; Treasurer, Mr. Inglis M. Uppercu, Aeromarine Plane and Motor Company, New York City; Secretary, Mr. Benjamin L. Williams, New York City; Assistant Treasurer, Mr. A. H. Flint.

Mr. Russell succeeded Mr. H. B. Mingle, the provisional president, who resigned.

'Resolutions of appreciation for Mr. Mingle's past services to the Association were passed, and as a token of the personal appreciation of the members for him, he was presented with engrossed resolutions and a handsome gold watch suitably engraved.

* * *

Six committees were authorised as follows:—

Advisory Committee: Albert H. Flint, H. B. Morse, Benjamin Foss.

Committee on Patents: Curtiss Aeroplane and Motor Corporation (Chairman), Thomas-Morse Aircraft Company, Sturtevant Aeroplane Company.

Committee on Materials: L.W.F. Engineering Company (Chairman), Curtiss Aeroplane and Motor Corporation, Burgess Company, Standard Aero Corporation, Sturtevant Aeroplane Company, B. F. Sturtevant Company, Aeromarine Plane and Motor Company, Thomas-Morse Aircraft Company.

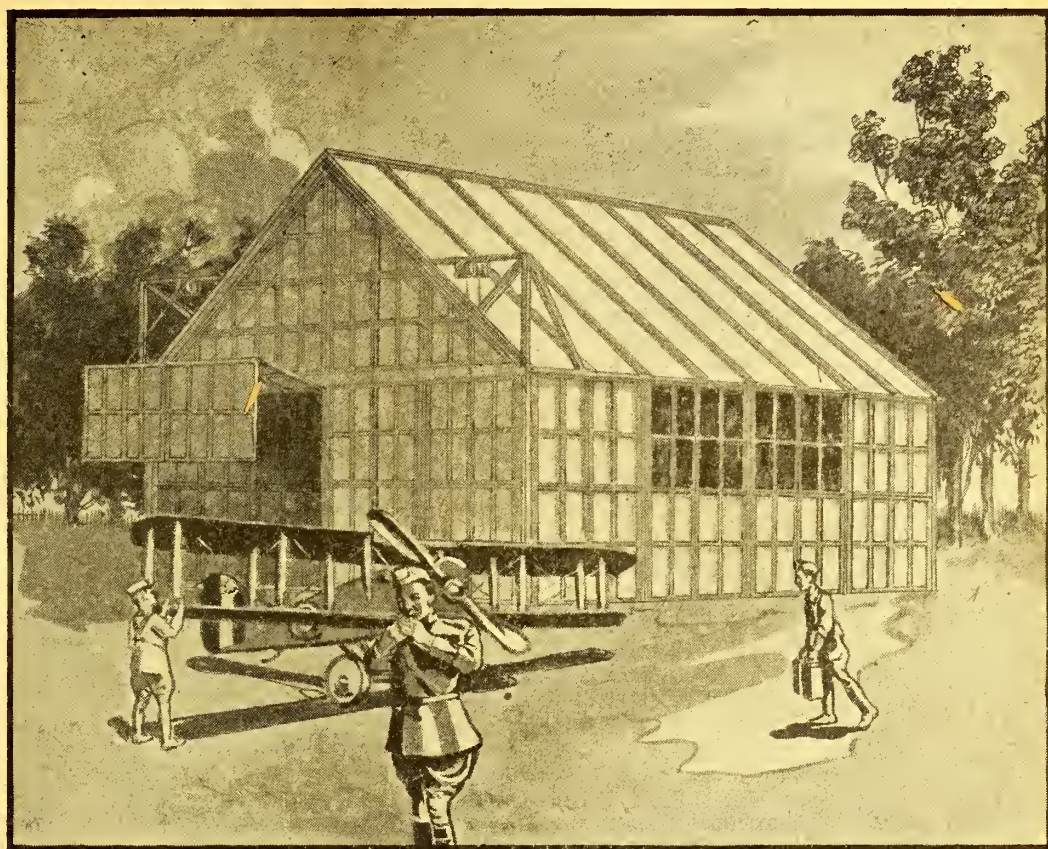
Membership Committee: Benjamin Foss, H. B. Mingle, Mr. A. H. Flint.

Standardisation Committee: Curtiss Aeroplane and Motor Corporation (Chairman), L.W.F. Engineering Company, Burgess Company, Standard Aero Corporation, Sturtevant Aeroplane Company, B. F. Sturtevant Company, Aeromarine Plane and Motor Company, Thomas-Morse Aircraft Company.

Publicity, Advertising and Censorship Committee: Fay L. Faurete.

It was resolved to create a design typifying the aircraft industry to be used as a distinctive mark of the Association.

Mr. F. H. Russell, the President of the Association, has been concerned with aviation since the earliest days, first with the Wrights and then in charge of the Burgess Company. A Yale graduate and a man of remarkable abilities and extensive experience, so that he is especially fitted to hold the post.



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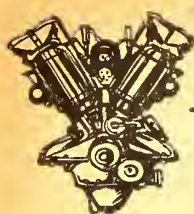
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IN KIND AND CONSTRUCTION

By Geoffrey de Holden-Stone



AUT MELIORA?

What better? There truly, is all hell in two words. Don't you know that even heaven is only heaven because there can be nothing better? If, in its rare earthward gleam, that first magnificent madness called enthusiasm, one believed that anywhere there could be a land better worth dying for, or a lovelier woman, a bonnier child, or a braver handiwork than ours, should we ever have the heart to fight and love, or work greatly like the gods, who have none of the sad wisdom of good and evil that we inherit? Whereby we lose our Edens.

So we become conscripts to Life, by joyless duty. No more the live red rose in a kiss. We have no will to beget godlings to be great men, only the legalised bastards of convention. Utterly we fail to encompass our best. For enthusiasm, they say, is not good form. That other word for coward half-belief. Form! the devil's greatest invention to destroy the body and soul of all things that matter. The lifeless, putrid shadow that remains when these are gone. The creeping, rotting disease of which England was dying fast on her feet until came this healing war. Yet—still we go on, to question merits and scratch for defects in all things: like mice devouring the mass, empty of grace or sacrament.

For me, I would rather believe, right or wrong, and glad in my belief, die in a year, than live on for a thousand, a questioning, analysing cynic, accepting nothing as it came until I had vivisected it to death. In the good years beyond, no doubt there will be much that is better. Finer men and women possibly—though our common sample was always more than good enough for me to live with. Redder roses perhaps; and better motors amongst other things. All the better for our babes, if so, as their bit of luck.

Meanwhile, as to the motors, at least, I do not think we shall discover that better, by overmuch looking in the mouths of gift horse-powers for it. Careful only to avoid the bad and indifferent, we can afford to take thankfully the good as we find it.

After all, it is some man's best. And, at least, it will be no worse than it was, even if we do chance to find or invent a better. I say chance, because the best things are always found by not looking for them. Nobody ever found a sovereign in the street by looking for it of set purpose. Not honestly, anyway.

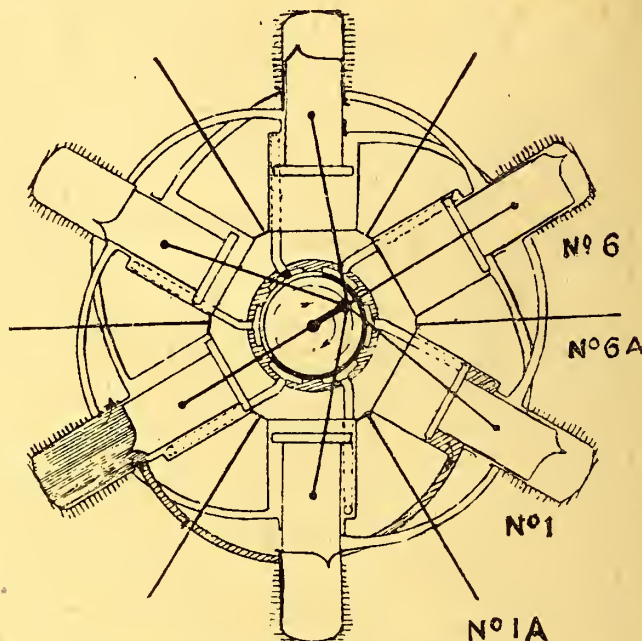
LAVIATOR POSSIBILITIES.

So I repeat confidently, what better of its kind could one find than the Laviator? To my mind, if it be only 50-65-h.p. instead of 500-h.p., or more, that is no defect nor disqualification. As it stands, there is nothing to prevent its duplication to 100-130-h.p., or its triplication, or even quadding, to 200-h.p. or 300-h.p.

In both of which cases, I should recommend its construction in thousand-series to-day. For we could do with them gladly on our sea-front and our land-front. If only because of that differential piston-persuaded induction, which—especially if accompanied by a certain stimulant that no one seems to remember since the early days at Brooklands—should drive it higher than any machine has ever flown. Also, because there would only be the carburettor to set, and the ignition from a magneto or two; this latter in the same firing order as the Anzani; albeit from a different starting position.

If then, we may anticipate the construction of a 12-cylinder model, at least, this ignition proposition becomes no less interesting for any other two-stroker with the same number of cylinders. At the outset of our assumption then, why the Anzani order?

The idea is curious, the Laviator being a two-stroke motor, But notice two things. The induction, we recollect, goes not from one cylinder to the next, sixty degrees away, but the one beyond that at 120 degrees. Precisely as in Anzani practice. So the ignition must follow suit.



Sectional diagram of the Laviator motor.

AS TO THE IGNITION SEQUENCE.

Secondly, the torque in such cases is always maintained by either the back group in a rotary or radial, or the opposite battery in a V or Y-type, by the next cylinder in group or battery that would be due to fire: that is, supposing that somehow the group or battery were two distinct motors, working to some single line of power transmission. This would seem to mean that No. 1 would be followed by No. 12.

But it is not so. The theoretical sequence is contradicted by the little fact that the crank behind is opposite to the one in front; that is, 180 degrees away from it. Naturally, it carries the piston position with it, and, hence, all the phases of the cycle.

So, taking the cylinder at four o'clock on the diagram as No. 1, the next to fire will be No. 4a at eleven o'clock; that is to say, the one just beyond No. 4 at ten o'clock, 180 degrees away.

Which next, then? Now remark the distinction from the Anzani scheme. The Laviator is built in groups of six cylinders, not five. That is to say, each group is in two alternating threes. And it is, furthermore, a two-stroke motor, so one does not go twice round the clock with each phase-happening, but only once. Notice, too, that the motor is turning clockwise as a rotary—as the diagram shows—and, therefore, being fired by the distributor running anti-clockwise as a radial.

Consequently, in either case, the third cylinder in turn to fire will not be No. 2 at six o'clock, but No. 6 behind, at two o'clock, in the alternate set of three in the front group. And No. 6 will be followed, not by No. 3 at eight o'clock, but by No. 3a in the second set of the group behind.

Now we revert to the first set of three in the front group. The next in turn will be No. 5, at twelve o'clock, 120 degrees behind No. 1. And it will be followed by No. 2a at seven o'clock. So we now see that while the sets of threes in each group—be it front or rear—alternate with each other, odd number with even, and anti-clockwise, or backwardly, for everything, the odd numbers in the front group are followed intermediately by the even numbers in the rear group, and vice versa.

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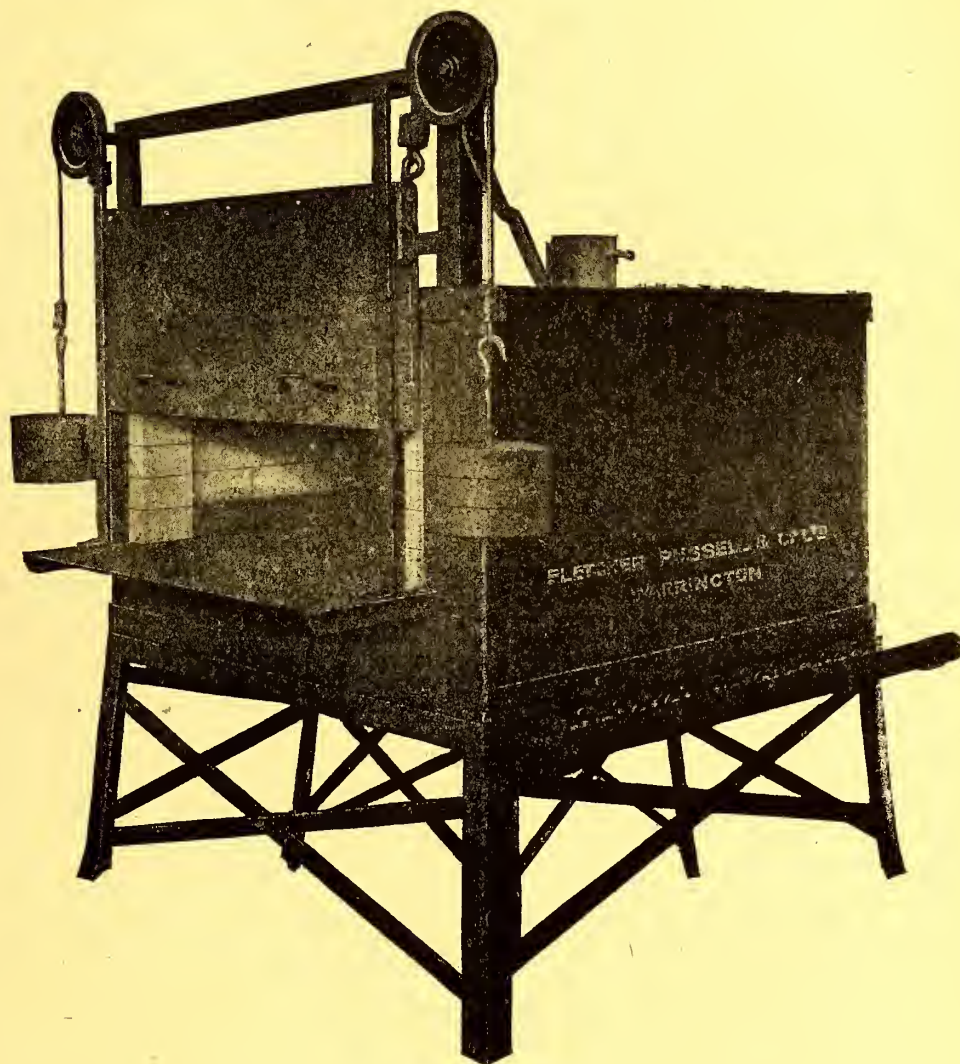
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So, having got rid of the first six, the remaining order in this uncommon sequence will be No. 4 at ten o'clock, No. 12 at five o'clock; No. 3 at eight o'clock, No. 6 at three o'clock; No. 2 at six o'clock, and No. 5 at one o'clock.

AND WHY JUST SO PARTICULARLY?

Let me anticipate one last query. Why—to take a single instance, whereby to establish the rule for all the rest—should No. 1 have been followed by 42 and not by 32? The chief reason is that, above all things, in a two-stroke aeromotor proposition, there must be no risk of its suddenly reversing, especially when switched on after being cut out. That risk—or the dread of it, which is worse—I verily believe has hindered two-stroke aeromotor development more than anything else; for everybody admits the mechanical advantages of the cycle.

But that is not the whole of it, nor a sufficiently satisfying answer. The further reason is, that the crank, being 180 degrees away, No. 42 is just in advance of that distance by five degrees, in the case of a rotary Laviator. Or as a radial, or in some 12-cylinder V-type, the distributor running the opposite way, would be five degrees in advance, on its way to meet the final compression and firing moment. In either case, therefore, 42 clearly represents an ignition moment automatically set five degrees in advance.

THE SAFETY FACTOR.

Whereas, on the contrary, No. 32 sequence would just as clearly have represented an ignition moment five degrees retarded; and, hence, a constant danger of the motor reversing; unless the pilot remembered to swing the ignition five degrees forward to start with, and then a further five to get any speed. He might as easily swing it back another five degrees, by mistake, or even ten, when he would assuredly reverse the motor on himself, and wonder why he crashed. But with the 42 sequence, even if he did make this mistake, he would not get further back than neutral point.

In this way, then, this reversing risk is practically eliminated; and the motor rendered inherently—and *automatically*—safe; for this reason, if no other. The only equivalent I can remember in aeromotor practice is the Salmson balance-weighted crank and back-gearing combination, devised for the same purpose. Only here we have a comparison between several pounds weight, and something which has no parts, weight, or magnitude.

ONE AND ALL.

At any rate, this particular sequence is interesting, first, because

THE GALLAUDET SEAPLANE.

The following description of the curious "fuselage-pusher" Gallaudet seaplane is taken from "Aerial Age," New York, of May 14th.

In the Gallaudet navy seaplane the structural advantages of the tractor type are combined with the advantageous seating of the occupants that are found in pusher machines. Pilot and passenger, being forward of the planes and propeller, have a wide and unobstructed range of vision which is so necessary in observation flights and in making successful landings.

The company recently delivered to the Navy Department a seaplane equipped with the new Gallaudet patented drive. The propeller efficiency, due to Mr. Gallaudet's patented construction, is 83 per cent. against the 75 per cent. maximum efficiency usually hoped for in propellers in the past. This type of construction eliminates a great deal of the head resistance, reduces weight, and permits the one four-bladed propeller revolving on a drum around the fuselage to be driven by either or both motors set inside the body of the machine and geared to the propeller shaft.

Another feature that makes for speed is that the centres of thrust and resistance are coincident.

The natural stability found in Gallaudet aeroplanes, produced by the pronounced sweepback and stagger and careful distribution of weights and areas, is even more evident in the navy seaplane. Streamlining has cut down head resistance to a minimum and in official flights for the Navy Department a speed of 92 miles an hour was developed, although the high speed specified by the Department was 88 miles an hour.

With a total flying weight of 4,600 lbs., the cruising radius is 1,000 miles, in straight-away flights, 500 miles and return.

GENERAL DIMENSIONS.

Span, upper plane	48 ft. 0 in.
Span, lower plane	48 ft. 0 in.
Chord	7 ft. 0 in.
Total lifting area	658 sq. ft.
Gap	7 ft. 7 in.
Overall length	33 ft. 0 in.
Net weight, unloaded	3,600 lbs.
Useful load	1,000 lbs.
Speed, range	92-45 m.p.h.
Motors, Duesenberg (2) each	150-h.p.

PLANES.

For the sake of clearness in the accompanying line drawing, the wiring of the cellule and main float has been omitted.

of its rarity—which, no doubt, has appeared to be a disqualifying complication, although simplicity itself when explained—and, secondly, because it represents—and at a glance—the whole matter of ignition, distribution, and wiring assembly for any 12-cylinder two-stroke motor, no matter how the cylinders are mounted.

We shall certainly not be content with eight or ten, when we can get twelve just as easily. So in anticipation of to-morrow's aeromotor developments—which all declare for the two-stroke cycle—and to hasten them by disposing of the least apparent problem, it may be worth while to memorise the sequence thus, "Three behind the last and 2 forward."

However, with regard to the Laviator, let us see exactly what we have obtained on the all-important outcome of working strokes per revolution. In the 6-cylinder model, of course, six, and no valve gear-losses to lessen the power output, as against three in any 4-stroker, *minus* these losses. But in the 12-cylinder model—at any rate, in the rotary type—we have got not only the full dozen completed, but the 2 sequence gives us an actual thirteenth working stroke, well begun!

THE PARADOX OF FACT.

Impossible! Think it out; or, better still, look and see. And the better to look, take the diagram, and ink in a complementary crank. And then lines for the axes of those A group cylinders. Notice now, that No. 52 at one o'clock was the last to fire. But also that the cranks are fixed at two and eight o'clock respectively. And then see into what relation the rotary motion will have run No. 1 and its piston: and in what angular relation its connecting-rod will be with the crank *before* No. 52 can possibly have completed its full piston-outstroke.

Now, it will be clear that any angular relation whatever between rod and crank must be evidential of a stroke of some kind in progress; and according to the degree of angularity, the stage of progress. But remembering that No. 1 was next for its firing, look at the respective angles with their cranks of the rods of No. 52 and No. 1. Well, then? Is one not justified in asking whether the Laviator is not good enough, if we never get a better? Or better, at least, than any other of its type we have had so far? And, again, whether the possibilities of a 12-cylinder model are not well worth immediate exploitation? Also in wondering why though so clear, they have lain neglected so long.

I hardly think any practical designer will need further notice of these questions, at any rate.

(To be continued.)

Planes have no dihedral. Sweepback, 8 deg. 30 minutes. Upper plane staggered 77 deg. or 1 ft. 9 in. forward of the lower. Planes set at an incidence of 7 in. Ends of planes are raked at an angle of 22 deg.

The planes are in six sections. Central sections, above and below the fuselage, 2 ft. 4½ in. wide. Each central section has an area of 23.48 sq. ft. Each of the four outer sections has an area of 138.76 sq. ft.

Ailerons on upper and lower planes each have an area of 13.88 sq. ft.

Centre panel struts are centred 2 ft. 4½ in. apart. The centre interplane struts are spaced 8 ft. 7.83 in. from these. From the centre interplane struts the outer struts are spaced 8 ft. 6.308 in. This leaves an overhang of 5 ft. 2 in. from centre line of outer strut to the outer tip of aileron. From forward to rear main wing beam, struts are located 4 ft. 4 in. apart.

FUSELAGE.

Overall length 29 ft. 6 in. Fuselage is built up of mahogany veneer. Maximum width and depth between the central wing panels, 3 ft. 6 in. Sides are flat, with top and bottom rounded off.

The leading edge of the propeller is located 16 ft. from the nose of the fuselage. Aft of the propeller, the body tapers to a vertical chisel edge, to which the rudder is attached.

The observer and pilot are located in separate cockpits in the nose of the fuselage.

TAIL GROUP.

The horizontal stabiliser is divided, one section at either side of fuselage. It is fixed at a lifting or positive angle of 3 in. in its length of 6 ft. Along the rear beam of the stabiliser, the distance from tip to tip is 10 ft. 4 in. The rear beam is situated at the centre line of the fuselage, which is also the centre line of propeller thrust. Area at either side of fuselage, 15.17 sq. ft. or a total area of 30.34 sq. ft.

Each of the two elevators has an area of 11.5 sq. ft. They measure 12 ft. from tip to tip and are 2 ft. 6 in. wide. Attachment to the stabiliser is by four hinges each.

There is no vertical fin or stabiliser. The rudder is of the balanced type. Maximum width, 3 ft. 6 in. Maximum height, 5 ft. Area, 12.5 sq. ft. The rudder area is equally disposed above and below the fuselage.

FLOATS.

Floats of mahogany. Main float is 25 ft. long. Maximum beam, 3 ft. 6 in. Maximum depth at the step, 2 ft. 6 in.

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Attachment is made to the fuselage by a pair of struts at the forward end and a single strut at the rear end.

The float projects 8 ft. in front of the upper plane, or 1 ft. forward of the fuselage nose. The step occurs 13 ft. 6 in. from the front of the float. Two air vents are run from back of step to the deck of the float. The bottom is the V type, and the top has a turtle back deck. A rudder for steering on the water is hinged to the float extremity.

The centre line of buoyancy is located at a point 1 ft. 3 in. forward of the step. The centre line of lift of the machine occurs 1 in. back of the buoyancy line. The water line indicated on the drawing is for a load of 3,573 lbs.

Wing tip floats are 1 ft. 3 in. wide. Top and bottom flat and sides of streamline contour.

MOTOR GROUP.

Two Duesenberg 4-cylinder vertical motors are installed in the fuselage. The bore and stroke is $4\frac{1}{2}$ in. by 7 in., and it develops 150 h.p. at 2,100 r.p.m. Weight with reduction gear, 509 lbs.

The propeller is four-bladed, 9 ft. 6 in. in diameter. The blades are attached to a metal ring which encircles the fuselage at a point 16 ft. from the nose. Spur gears connect the motors to the propeller ring. Radiators are built in at either side.

MARKET REPORTS.

Prices given are for quantities on usual terms.

June 14th, 1917.

COPPER.—Once more I have to report no change in the general situation of the Copper Market. Prices are stationary, and, as stated previously, the whole of the supplies are being utilised for National requirements.

Current Prices.

Copper Ingot (Standard) Cash	... £130 per ton.
Copper Sheet	..... 165 per ton.
Copper Tube	..... 20½d. per lb.
Brass Sheet 24G.	..... 16½d. per lb.
Brass Tube S.D.	..... 17d. per lb.

LEAD.—Supplies still continue to be the chief concern, and the demand for special War Purposes is very large; it is, therefore, extremely difficult to obtain Lead for other purposes.

The market does not show any alterations, and the price for Pig Lead remains at £29 10s. to £30 10s.

STEEL.—There is little hope now of substantial supplies from U.S.A., and tremendous efforts are being made here to increase the output of all classes of Steel. The output of Aircraft Steels is

certainly improving, and prices also continue favourable, although there is a slight indication that prices will shortly increase. The demand for Sheet Steel is steadily increasing, and the output is now assuming enormous proportions. Prices are also steadily increasing, and there is no indication that they are likely to remain at the present figure.

Current Average Prices.

R.A.F. 3B Steel	38s. to 40s. per cwt. Basis.
R.A.F. 1E Steel	78s. to 80s. per cwt. Basis.
R.A.F. 9A Steel	32s. to 33s. per cwt.

TIMBER.—Prices are still advancing and it is impossible to see any hope of improvement. The Admiralty have received supplies of Spruce, but the general opinion is that a small percentage only will be of any use for aircraft work. Walnut is practically unprocurable, and Mahogany is still advancing. The prices obtained at a sale last week were extremely high, and give a very good indication of the upward tendency of the market.

Current Prices.

Silver Spruce,	17s. c.f.
Ash, English,	13s. 6d. to 14s. 6d. c.f.
Walnut,	2s. 5d.
Mahogany,	2s. 2d. to 2s. 4d.

ALUMINIUM.—There is still no change in the prices, and supplies are quite satisfactory.

Current Official Prices.

Ingot	... .. £225
Remelted	... .. £210

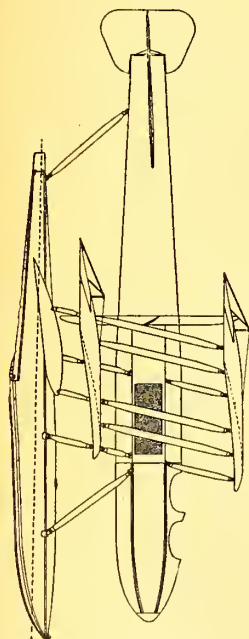
FABRIC.—It appears that although manufacturers were verbally informed that the prices had been fixed at the figure given in our previous reports, one or two of the weavers still held out for higher prices, and it appears that the Air Board have been compelled to agree. No official notification has been received, but it can be taken for granted that the prices given below are correct.

17C Cloth, 36 in. wide,	29½d. per yard.
Soaced Fabric, 38 in. wide,	31d. per yard.

TIN.—The recent fall, which was followed with a slight advance, brought forward buyers, and some good business was done. The market is now in fairly good condition, prices having fallen a little lower, and supplies are fairly satisfactory.

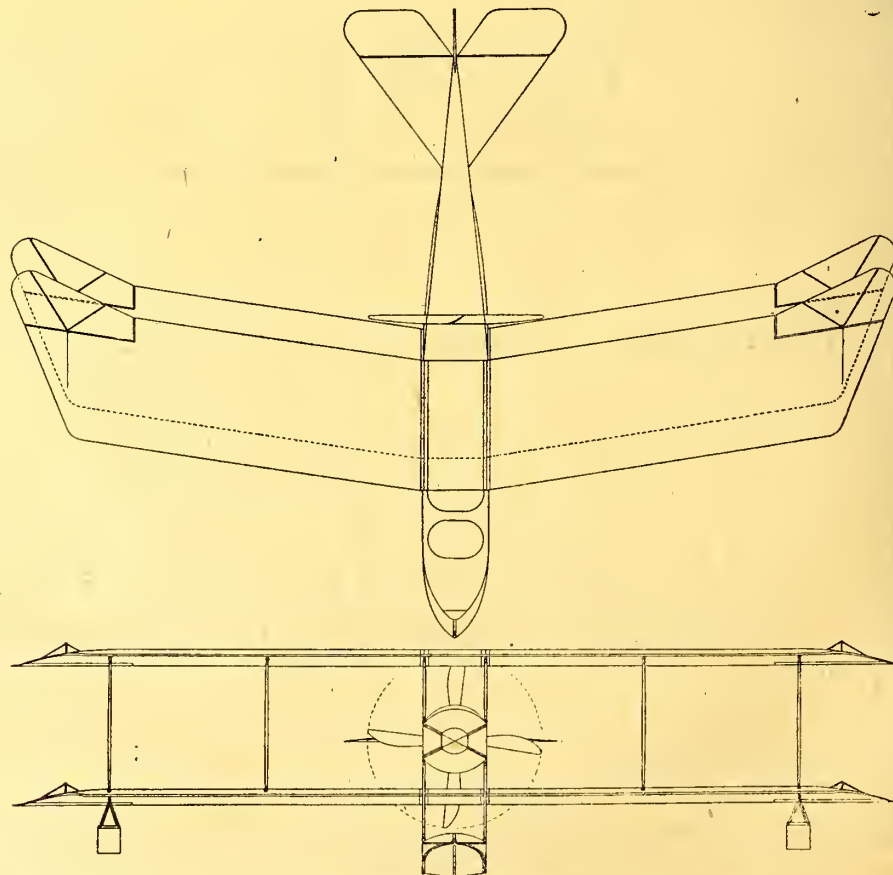
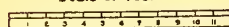
Current Prices.

To-day (June 11th) £236 0 0
A week ago 238 10 0
Two weeks ago 255 0 0



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THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by THE AEROPLANE from the current Official Patents Records.

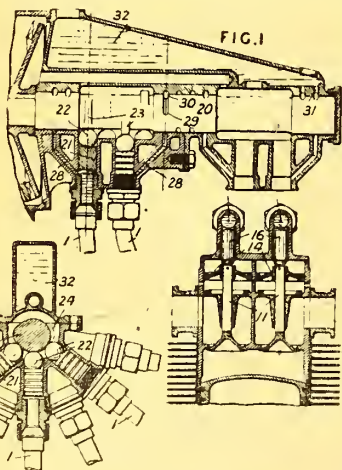
PATENT APPLICATIONS.

- British Emaillite Co., and another. Coverings for aircraft. No. 8011. June 5th.
 Brotherhood, Ltd., P., and others. Aero engines. No. 8199. June 8th.
 Brotherhood, Ltd., P., and others. Aero engines. No. 8200. June 8th.
 Davidson Aviation Co., and another. Metal propeller bush for aircraft. No. 8070. June 6th.
 Ellis, F. A. Screw propellers for aeronautical machines, etc. No. 8105. June 6th.
 Flower, S. A. Airships. No. 8055. June 5th.
 Gordon, N. R. Flying machines. No. 7965. June 4th.
 Greenwood, E. F. de B. Method of attacking and disabling aircraft, etc. No. 8017. June 5th.
 Kemp, W. J. Engines of aerial machines. No. 8066. June 6th.
 Pilkington Bros., and another. Mirrors for use on aircraft, automobiles, etc. No. 8065. June 5th.
 Porter, J. R. Means for driving aeronautical machines. No. 8045. June 5th.
 Power, R. F. Instrument for aerial artillery observation. No. 8215. June 8th.
 Prior, B., and others. Manufacture of wood propellers. No. 8265. June 9th.
 Sage and Co., F. Aviators' safety belts, straps, etc. No. 8112. June 6th.
 Sage and Co., F. Floats for hydroplanes, etc. No. 8114. June 6th.
 Snoeck, L. Aeroplane bombs, etc. No. 8056. June 5th.
 Sopwith Aviation Co., and another. Struts, spars, etc., of aircraft. No. 7982. June 4th.
 Spittle, J. T. Aileron control of aeroplanes. No. 8008. June 5th.
 Tarrant, W. G. Stays, struts, spars, ribs, etc., for aeroplanes, etc. No. 8116. June 6th.
 Waring and Gillow, and another. Spars for aircraft, etc. No. 8272. June 9th.
 Williams, W. F. Aeroplanes. No. 8061. June 5th.
 Willmer, A. W. Aircraft. No. 8091. June 6th.
- COMPLETE SPECIFICATIONS ACCEPTED, PRINTED COPIES OF WHICH ARE OBTAINABLE ON AND AFTER JUNE 28TH, 1917.
- 26,841/13. Nov. 21st, 1912. Vial. Apparatus for sighting, and also for automatically dropping bombs or other objects from aircraft.
- 106,639. Oct. 21st, 1916. McGregor, G. S. Aeroplanes.
- 106,645. May 25th, 1916. Quick, W. B. Planes of aeronautical machines, capable of travelling either in the air or on the water.
- 106,794. Jan. 2nd, 1917. Royce, F. H., and Rolls-Royce, Ltd. Reduction gear for aero engines, geared turbines, and the like.

ABRIDGMENTS OF RECENTLY PUBLISHED SPECIFICATIONS.

- 105,373. Internal-combustion Engines. LANCHESIER, F. W., 53, Hagley Road, Edgbaston, Birmingham.

VALVE-GEAR.—In a radial-cylinder or other internal-combustion engine having fluid-operated valves, a number of valves are operated by a single cam 23 acting upon radially-disposed plungers 21. A column of oil in a pipe 1 is interposed between each plunger 21 and a ram 16 acting on the valve stem 11. The valve is closed by compressed air or by suction acting on the under or upper side of a piston 14. To replace leakage of oil, each pipe 1 communicates by a passage 28 (with semicircular grooves 29, 30 in the cam shaft and bearing, to which oil under pressure in a reservoir 32 has access by openings 31. When the cam is operating, the passage 28 is closed by the ungrooved part of the cam shaft 20. The cams engage balls 22 in contact with the plungers 21; or they may engage directly with the plungers, which, in this case, have cylindrical upper ends



and means for preventing them from turning into unsuitable positions. In order that all the plungers shall act downwardly, they are arranged in two planes, for instance, four in one plane and three in the other, as shown in Fig. 2, two cams 23, 24 set at 180 degrees apart being used.

FIG. 5.



- 105,421. Screw Propellers. TITLEY, J., Wellington Road, Bilston.

A propeller is composed of laminæ *b*, which are twisted, while the connecting-medium, generally glue, is wet, into positions in which they lie parallel with the faces of the finished propeller, the laminæ being secured or retained in their twisted condition. Blades of this construction are without a joint at the centre, and the hub may be completed by additional layers *c*.

FIG. 3. a

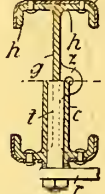
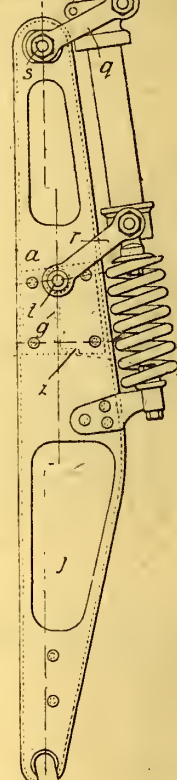


FIG. 1



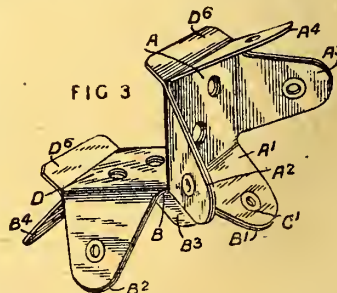
- 105,477. Motor-cycles, Aeroplanes, etc. BARNES, F. W., Rex House, St. Andrew's Square, Surbiton, Surrey.

FORKS; SPRING DEVICES.—A fork for a motor-cycle, aeroplane, etc., is constructed from a pair of stamped sheet-metal plates *a* of substantially U-section, each plate being of approximately isosceles-triangular outline with the apex at the rear and the base at the front, and the two plates being spaced apart by distant-pieces secured thereto. As shown in Figs. 1 and 3, the distance-pieces are tubular and serve as bearings for the spindles *s*, *t* of links *g*, *r* connecting the fork to the steering-stem, and the lower distance-piece has a downwardly-extending rib *g* and end cheeks *h* fitting within the fork plates. Brake fittings may be secured to the plates, and the rib *g* may have a lug *z* for the attachment of the mud-guard. The lower end of each plate may be thickened or provided on its inner face with a stiffening-plate. The plates *a* may be embossed as shown at *j*.

- 105,460. Aeronautics. WARREN, W. T., London and Provincial Aviation Co., London Aerodrome, Hendon, Middlesex.

FRAMEWORK.—A connecting-clip for use in aeroplane fuselages consists of two plates *A*, *B* arranged at right-angles to one another and having lugs *A*¹, *B*¹ secured together by an eyelet *C*¹, in combination with a stiffening-plate *D* bent at right-angles and secured in the angle between the plates *A*, *B*. The plates *A*, *B* have also lugs *A*², *A*³, *B*², *B*³ secured by eyelets to corresponding lugs on the stiffening-plate, all the lugs forming connexions for bracing-wires. The clip is screwed to the longeron of the fuselage, and lugs *A*⁴, *B*⁴ are bent down and screwed to the adjacent transverse and vertical members which abut against the rectangular faces of the clip, lugs *D*⁶ on the stiffening-plate being also bent down onto the longeron.

FIG. 3



A RETURN TO BUSINESS.

One is pleased to learn that Mr. Douglas Hutchinson, London manager of the British Aeroplane Varnish Co., Ltd., proprietors of Titanine Dope, whose activities have been seriously impeded for some weeks by eye trouble, is now nearly well, and will be pleased to make appointments with anyone in the Aircraft Industry who wishes to discuss Titanine business.



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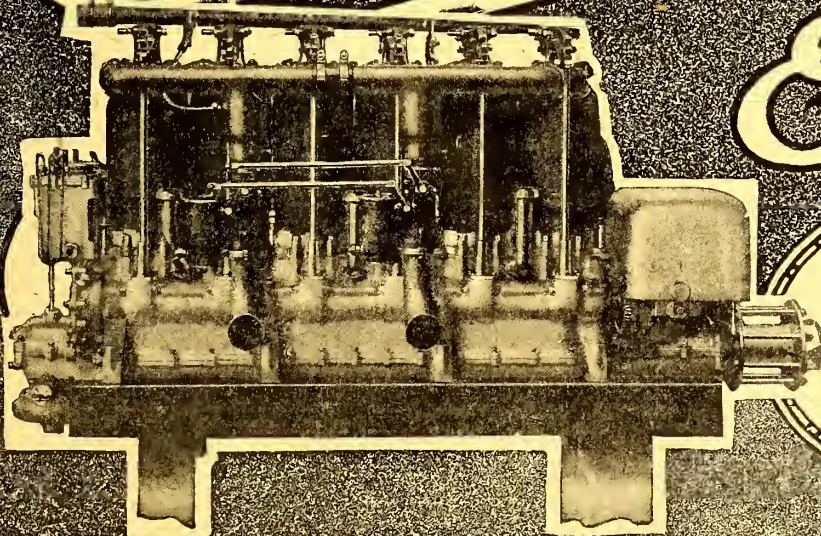


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AEROPLANE MANUFACTURERS—

Aircraft Manufacturing Co., Ltd., 47, Victoria St., S.W.

Armstrong, Sir W., Whitworth & Co., Ltd., Newcastle-on-Tyne

Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds

Boulton & Paul, Ltd., Rose Lane Works, [Norwich]

British & Colonial Aeroplane Co., Ltd. (The Bristol Co.), Filton, Bristol

British Caudron Co., Ltd., Broadway, Cricklewood, N.

Central Aircraft Co., Palmerston Works, High Rd., Kilburn, N.W.

Curtiss Aeroplane Co., L. J. Seely, Clun House, Surrey St., Strand, W.C.

Davidson Aviation Co., Ltd., Hammersmith, W.

Eastbourne Aviation Co., Ltd., Eastbourne

Grahame-White Aviation Co., Ltd., London Aerodrome

Handley Page, Ltd., 110 Cricklewood Lane, N.W.

Mann, Egerton & Co., Aircraft Works, Norwich

Martinsyde, Ltd., Brooklands, Byfleet

National Aircraft Co., Ltd. 15, Hackney Rd. N.E.

"Nieuport" & General Aircraft Co., Cricklewood, London, N.W.2.

Norman-Thompson Flight Co., Ltd., Bognor

Roe, A. V., & Co., Ltd., Manchester

Sage, F., & Co., Ltd., Peterborough

Saunders, S. E., Ltd., East Cowes, I.O.W.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W.

Sopwith Aviation Co., Ltd., Kingston-on-Thames

Standard Aircraft Manufacturing Co., Eppingham House, Arundel St., W.

Vickers, Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.

Warling & Gillow, Ltd., Hammersmith

Westland Aircraft Works, Yeovil

White, J. Samuel, & Co., Ltd., East Cowes

AIRSHIPS—

Airships Ltd., 47, Victoria St., S.W.

Short Bros., Rochester, Eastchurch and Whitehall House, S.W.

ALUMINIUM CASTINGS—

Coan, R. W., 219, Goswell Rd., London, E.C.

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3.

Willans & Robinson, Ltd., Victoria Works, [Rugby]

ANNEALING FURNACES

Fletcher, Russell & Co., Ltd., 15 Fisher Street, Southampton Row, W.C.

BEARINGS (Etonia Cast Phosphor Bronze)—

Yorkshire Engineering Supplies, Ltd., Wortley, Leeds

BORRODIZING—

The Deptford Steel & Iron Works, Ltd., 1 and 2, Old Pye St., Westminster

BRASS SHEETS FOR TIPPING PROPELLERS—

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3.

BUILDINGS—

Boulton & Paul, Ltd., Rose Lane Works, Norwich

Fairby Construction Co., Ltd., 117, Victoria St., [S.W.]

Palmer, T. W., & Co., Church Road, Merton Abbey, Surrey

The Wilfley Co., Ltd., Salisbury House, London

CARBURETTORS—

Hobson, H.M., Ltd., 29, Vauxhall Bridge Road

CASTINGS—

Lucraft, H., & Co., 147, Fenchurch Street, London, E.C.3.

CASTINGS (Aluminium)—

Coan, R.W., 219, Goswell Road, London, E.C.

Willans & Robinson, Ltd., Victoria Works, [Rugby]

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Cellon Ltd., Broad St. House, New Broad St., E.C.2.

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Burberry's Ltd., Haymarket, S.W.

Dunhill's, Ltd., Euston Rd., N.W.

Hazel & Co., 4, Princes St., Hanover Sq., W.

Robinson & Cleaver, Ltd., Regent St., London

COMPONENT PARTS—

Accles & Pollock, Ltd., Oldbury, Birmingham

B. D. V. Aircraft Spares, Syon Chambers, 16A, Kew Road, Richmond, Surrey

Central Aircraft Co., Palmerston Works, High Rd., Kilburn, N.W.

The Osborne Aircraft Co., Ltd., Whin Hill, Greenock, Scotland

CORDS, TAPES AND THREADS—

MacLennan, J., & Co., 30, Newgate St., E.C.1., and at Glasgow

DOPES—

British Aeroplane Varnish Co., Ltd., Milburn House, Newcastle-on-Tyne, and 166, Piccadilly

British Cellulose Co., Ltd., 8, Waterloo Place, [S.W.]

Cellon, Ltd., Broad St. House, New Broad St.

ELASTIC CORDS—

Tubbs, Lewis, & Co., 29 & 30, Noble St., E.C.2.

ELECTRICAL ACCESSORIES—

The Edison Swan Electric Co., Ltd., Ponder's End, Middlesex

ENGINES AND PARTS—

Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford

Arrol-Johnston, Ltd., Dumfries

Beatty School of Flying, Ltd., London Aerodrome

Beardmore Aero Eng., Ltd., 112, Great Portland Street

Dudbridge Iron Works, Ltd. (Salmson), 87 Victoria St., London, S.W.

Gordon Watney & Co., Ltd., Weybridge

Green Engine Co., Ltd., Twickenham

Gwynnes, Ltd., Hammersmith Iron Works, Hammersmith, W.

Sturtevant Motors Co., 147, Queen Victoria St.

Sunbeam Motor Car Co., Ltd., Wolverhampton

The Gnome & Le Rhone Engine Co., Ltd., 47, Victoria St., S.W.

Willans & Robinson, Ltd., Victoria Works, Rugby

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Dutton Aircraft, Chester Aerodrome, Chester

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Cowper-Coles Manufacturing Co., Sunbury-on-Thames

Boulton & Paul, Ltd., Rose Lane Works, [Norwich]

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Moss Gear Co., Ltd., Thomas St., Aston, Birmingham

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Mendine Co., 8, Arthur St, E.C.

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Triplex Safety Glass Co., Ltd., 1, Albemarle St. Piccadilly, W.1.

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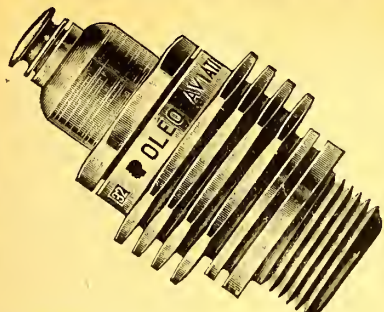
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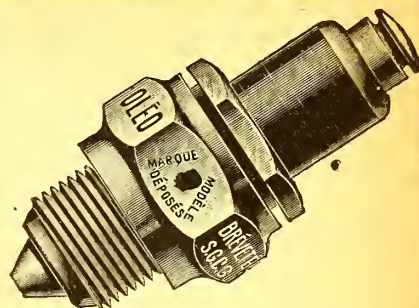
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(Continued from page 1593A.)

of Johannesburg, South Africa, was married to Fortune, only daughter of Mrs. Graham, and granddaughter of Captain William Davidson, of Cleadon, Sunderland, by the Rev. Canon J. Hasloch Potter, R.D.

SMALE—NORTHCOTT.—On June 9th, at St. Peter's Church, Dulwich, S.E., George Charles, Sec. Lt., Leicester Regt. and R.F.C., eldest son of Mr. and Mrs. G. W. Smale, of Streatham, was married to Gertrude Annie, daughter of Mr. and Mrs. Northcott, of Dulwich, by the vicar, Rev. A. Knott, D.D.

BIRTHS.

GODDEN.—On June 5th, at East Horsley, Surrey, to Aileen, wife of Guy Langham Godden, Lt. R.F.C.—a son.

SAMPSON.—The wife of Capt. Noël Sampson, R.F.C., of Buxshalls, Lindfield, Sussex, of a daughter.

SPAIN.—On June 13th, at Upavon, Wilts, the wife of Capt. G. A. R. Spain, Indian Army and R.F.C., of a daughter. (Indian papers, please copy).

Sec. Lt. M. Topham, R.F.C., was reported missing on the Western front on April 13th. Mr. F. D. Topham, of 42, Hadlow Road, Tonbridge, would be glad of any information concerning him. Will those communicating with R.F.C. officers now prisoners in Germany kindly inquire for any information as to the fate of Mr. Topham.

FRANCE.

OFFICIAL COMMUNIQUÉS.

JUNE 12th.—A German aeroplane was brought down in Lorraine by our special guns. The two aviators were taken prisoners.

ARMY OF THE ORIENT.—There has been aerial activity on both sides. British aeroplanes have bombarded Petric (in Bulgaria). In the course of an air fight an enemy aeroplane was forced to land.

JUNE 13th.—**ARMY OF THE ORIENT.**—British aviators bombarded the enemy depots at Bogdanci (west of Lake Doiran).

JUNE 15th.—**ARMY OF THE ORIENT.**—British aviators bombarded the station of Porna (9½ miles south-east of Seres).

JUNE 16th.—**ARMY OF THE ORIENT.**—The French air service bombarded enemy positions in the direction of Lake Malik.

JUNE 17th.—**ARMY OF THE ORIENT.**—The British air service inflicted great damage on the enemy encampments at St. Vrac, 10 miles north of Petrich.

JUNE 18th.—**ARMY OF THE ORIENT.**—British aviators successfully bombarded the station of Tumba (7½ miles east of Seres) and several enemy munition depots.

GERMANY.

OFFICIAL COMMUNIQUÉS.

JUNE 12th.—In the largely-increased aerial activity during the month of May the Flying Corps has achieved great success in the execution of its manifold duties.

Among those who have especially distinguished themselves, in addition to the battle aviators and infantry aviators, were those indispensable artillery aviators who, admirably supplemented by the observation officers in the captive balloons, directed our fire and observation services.

In the West, the East, and in the Balkans, we lost 79 aeroplanes and nine captive balloons.

Of the enemy aeroplanes shot down 114 are behind our lines, and 148 were seen to fall behind the enemy positions.

Further, the enemy has lost 26 captive balloons and a further 23 aeroplanes, which were compelled to land as a result of fighting.

NAVAL.—On Sunday, some of our seaplane squadrons successfully bombarded the Russian naval bases at Lebaru and Arensburg. Some military buildings were almost entirely destroyed.

JUNE 13th.—To-day our aviators dropped bombs on the Fort of London.

EASTERN THEATRE OF WAR.—The fighting activity kept within the usual limits. Russian aviators have become more active of late, and have flown over our lines on several occasions. Since the beginning of June five have been shot down. The dropping of bombs on Tukum was answered by a retaliatory aerial attack on Schlok.

JUNE 14th.—A fleet of our large aeroplanes yesterday afternoon reached London and dropped bombs over the fortress, and during clear weather observed the effects of good hits. In spite of a strong defensive fire and numerous aerial engagements—during which an English aviator fell down over the Thames—all aeroplanes returned unharmed.

JUNE 16th.—Naval airship L43 is missing since Thursday last. According to English reports it was shot down in the North Sea by English naval forces.

JUNE 18th.—On the night of the 16th-17th one of our naval air squadrons, under the command of Captain Victor Schütze, attacked important fortresses in the south of England, good results being observed.

The airships had fierce fighting with the British sea and land forces and aviators, in the course of which "Z48" was brought

down in a burning condition over the sea by an enemy aviator.

The whole crew and the commander above mentioned met the deaths of heroes.

The remaining airships returned safely.

RUSSIA.

OFFICIAL COMMUNIQUÉS.

JUNE 12th.—South-east of Jakobstadt one of our battleplanes was brought down by the German artillery, and fell in our territory. The pilot, Capt. Kuriloff, was killed; the machine was destroyed. In the region of Shumbiany (north-east of Halez), an enemy aviator set fire to one of our captive balloons, which was burnt; the officer observer, Spassya, was injured.

[The persistent accounts of Russian aeronautical reverses in official communiqués leads one to believe that the Russian General Staff considers confession good for the soul, a belief which is apparently not held by other belligerents.—Ed.]

AUSTRIA.

OFFICIAL COMMUNIQUÉS.

JUNE 11th.—In the Sugana Valley . . . our aviators shot down two Italian aeroplanes.

JUNE 12th.—In Eastern Galicia there has latterly been an increase in enemy artillery and flying activity.

An Italian air squadron dropped bombs on Durazzo. Several Albanians were killed.

JUNE 18th.—Two enemy machines were brought down yesterday by our aviators above Gorizia, and fell east of Vertoiba and near Ranziano in the Frigidi (Vipacco) Valley.

During the night two of our airships successfully bombed troops assembled round Tolmino and the enemy batteries on Mt. Hermada.

ITALY.

OFFICIAL COMMUNIQUÉS.

JUNE 15th.—Aerial activity has been intense on the Trentino front. Two enemy aviators were brought down on the slope of Monte Verena and in the valley of the Maggio Torrent. Two others were compelled to land in their own lines in the Val Sugana, and a fifth machine, struck by our fire, fell to earth on the slope of Monte Zebio (Asiago Plateau). One of our machines is missing.

JUNE 16th.—On the Julian front, our battleplanes, supported by scout machines, dropped 1,800 kilogrammes (about a ton and three-quarters) of explosives on enemy hutments and camps in the S. Lucia zone (Tolmino), and in the Bazza Valley (Upper Isonzo). All our machines returned safely.

JUNE 17th.—This morning hostile aircraft dropped bombs on Gorizia and some other inhabited localities in the plain. No damage was done, and there were no casualties.

U.S.A.

The New York correspondent of the "Morning Post" said, on June 14th:—

The generally well-informed Washington correspondent of the "Evening Post" telegraphs that the Council of National Defence (consisting of expert military advisers to the Government) has decided in favour of an immediate construction of 100,000 aeroplanes, sufficient to supply 25,000 aviators at all times. Such an air fighting force, he says, would be second to none. Congress will be asked to authorise the expenditure.

* * *

It was reported from Washington on June 15th that six hundred million dollars (£120,000,000) for aeroplanes will be asked of Congress in an Appropriation Bill to be introduced shortly at the request of the Council of National Defence. This is in addition to 64 million dollars (£12,800,000) already appropriated for aircraft in the war Budget measure just enacted by Congress.

Congress is now considering a Bill to create a Department of Aeronautics, with its chief in the President's Cabinet. An "Air Navy" which will dominate every square mile of the Western front was advocated before the Senate Committee by Mr. Howard Coffin, of the Council of National Defence. He urged that a fleet of aeroplanes so numerous and formidable as to preclude the possibility of German aviators even leaving their aerodromes for the shortest flight observations would so blind the eyes of the German Armies as to throw the balance of power completely and permanently into the hands of America and the Allies.

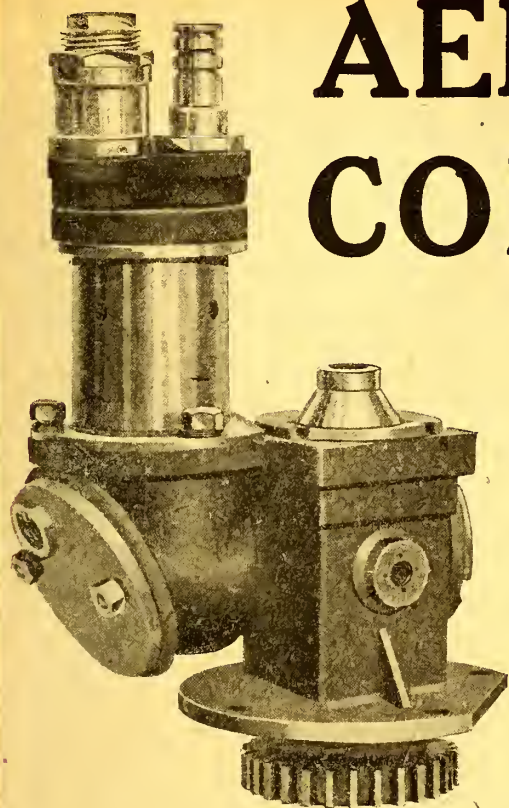
With such an end in view, he advocated the mobilisation of every industry in the United States capable of participating in the work of building America an air fleet that should hold complete dominion over Western Europe.

BELGIUM.

OFFICIAL COMMUNIQUÉS.

JUNE 12th.—One of our aviators brought down a German machine, which fell in the neighbourhood of Beerst (north of Dixmude).

JUNE 15th.—Yesterday our aviators brought down two enemy machines, which fell in the adversary's line. This morning a third German aeroplane was attacked by our aviators and descended in flames near Keyem.



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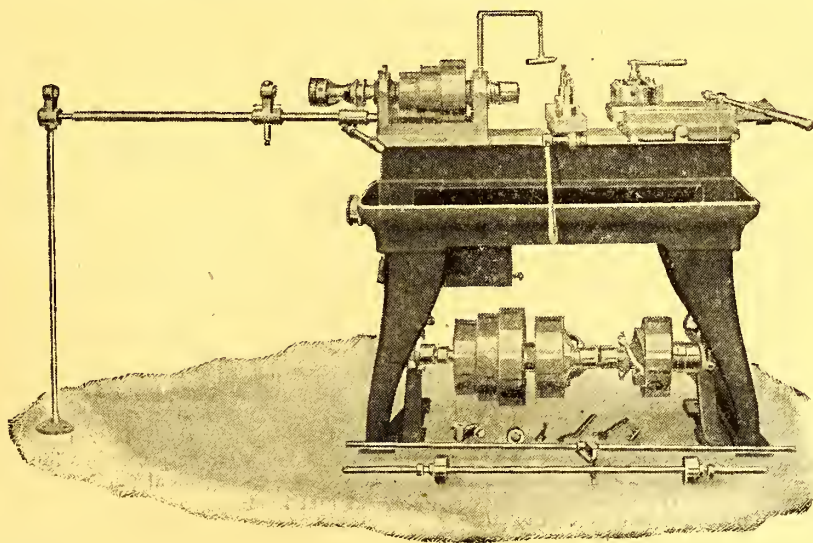
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AIRCRAFT IN THE HOUSE.

AIR RAIDS.

On the Adjournment on June 14th, Mr. Joynson-Hicks said: I should like to ask a question or two with regard to the air raid of yesterday. I am not going into the whole question at the present moment; but, as the House knows, there is a somewhat strong feeling amongst the people of London that they would like at least to be reassured that everything that possibly can be done for their protection is being done.

I desire to say at once that I do not want a single machine brought back from the front. I do not want the Army or Navy crippled in the slightest degree in order that we here may be kept in safety. The Army comes first, and we want it as fully supplied as possible with the best machines and the best guns.

I quite realise that London is infinitely larger than any of our provincial cities. At the same time, there was very great disinclination, we remember, in this House a year or so ago to give any kind of warning in provincial cities. It has now been found possible to give warning in all towns on the South and South-East Coasts in order that people may remain indoors. It is very much safer to keep indoors when a raid is taking place than to go gaping in the streets to see what is happening.

If my right hon. friend can give us any idea of whether it is possible to have some kind of warning, such as is given to provincial towns and cities, it might be a great advantage in keeping the people of London under cover, because there will be more raids.

I do not know whether the Under Secretary for War can give any information on the other side of the question, apart from police warning, as to the arrangements made for the anti-aircraft defence of London, and whether he can assure us that the best guns are now being used.

Further than that, he may be able to tell us something of the arrangements for sending up aeroplanes for the defence of London. It was freely said at the time of the Folkestone raid that there was notice of it in Great Britain three-quarters of an hour before bombs were dropped on Folkestone. It is also said that forty-five minutes at least before bombs were dropped on London the advent of hostile aeroplanes was known over the coast of Essex. If that is so, there was surely time for our aircraft to ascend and meet the enemy in the air.

Generally speaking, I think the House and the country must realise that when machines come over, as they are able now to do, at a height of 15,000 to 20,000 feet, and at a speed of 80 to 100 miles an hour, it may not be always possible to stop them. I do not ask the hon. gentleman to give an assurance that it is at all possible completely to eliminate raids of that kind, but I do ask the Government to take into very serious consideration the policy of reprisals on German towns.

Germany has now entered on warfare, not only against the Army of Great Britain, but has declared deliberate war on the nation, the men, women and children of our country. She is going definitely and persistently to pursue that warfare on the nation, and I submit to the House and the Government that the time is very rapidly approaching when, whether we like it or not, we shall be forced to declare war in the same way on the German people. Not that I have any desire whatever for the exercise of cruelty, or to slay Germans because they have slain our people. I say this because I believe it is the only possible way of bringing home to the German nation the enormity of what they have done.

I ask the Government to state, not that there will be a small and insufficient raid on a town like Cologne, or any similar German town, but that as soon as a raid of this sort, involving, as it has done, 500 casualties, takes place, stern and swift reprisals will take place on German towns. I ask for that, and that the Government should very seriously consider it. I cannot ask the hon. gentleman to make a statement on that to-night, because it must be a matter for the very careful and serious consideration of the War Cabinet, but I do ask him to inform the War Cabinet that feeling is rising.

Sir G. Cave: It is only natural after so serious a raid as that which occurred yesterday that a statement should be asked for regarding it at the earliest moment in the House of Commons, and that Members should want the fullest information that can properly be given to them. I have the figures as last ascertained of the casualties which occurred yesterday, and they are very serious. The number of killed as far as yet known is 104, the number seriously injured 154, and the number slightly injured 269. These figures make a total of 527 casualties, including, I am sorry to say, 120 children, either killed or injured.

Our enemy has made the statement that his aeroplanes yesterday bombarded the fortress of London. I hope it will not be forgotten that among the victims of that bombardment are 120 young children, a number of them under five years of age.

[Why have children in a fortress, and if London is not a fortress why protect it with guns and aeroplanes? Ed.]

Of course, the moment hostile forces reach the coast, or approach the coast, warnings are sent to headquarters in London. The air raid warning is, of course, distributed among the centres

to which information ought to be given, namely, to the headquarters of the police, the police stations, explosive factories, and other places which I need not particularise. Apart from that the police, both ordinary and special, have instructions to give all possible warning to people in the streets in the case of real danger, to go under cover, and the only question that has been raised, and which has caused any doubt in my hon. friend's mind, is whether some warning should not be given to the public, either by hooters or in some other way, that an air raid is impending. That is a question upon which I do not wish to pronounce finally.

It has been considered time after time, and I have always found it remarkable that on every occasion the experts have been unanimously of opinion that any public warning to the public as a whole of an impending air raid should not be given.

In the second place, it must not be forgotten that cases where there is a raid threatened or impending are many times more than cases where an actual raid occurs. In fact, in London, I think in the last two raids no warning could be given, because certain precautions were not observed, whereas for the last five times before when the warning was given there was no raid.

It follows that if you are to give a warning you must give it on all occasions. The result is immediate dislocation in the minds of the people. Many go down and look up at the air, as we all know from yesterday's and to-day's experience. And to-day there was no raid at all. They leave their work, not for a short time, but, in many cases, for the whole day. And the day's work is lost. In nearly every case where a warning is given of an air raid the man quite naturally leaves his work and is entitled to go home and make sure that his home and people are safe. Therefore, a warning of this kind only results in the loss of a day for many thousands, perhaps hundreds of thousands, of workmen.

There are two munition factories close to each other in one particular district just outside London. In one case they heard of the last raid, and the 4,000 men who were warned left their work and lost a day's work. In the other factory, some thousands of men had their whole day's work hindered from the same cause. To-day there was no raid, and what I have said shows how much work may be lost by warnings given when raids do not ensue. If you give that warning to all munition factories, and it is not needed, you put a stop to the manufacture of munitions which will have its effect upon the fighting forces and the lives of our soldiers and sailors.

This is an important consideration from the point of view of the Ministry of Munitions. If we made it a practice to give a public warning on every occasion when a raid is supposed to be possible that would result in such a dislocation of ordinary occupations and our preparations for war, that we should in that way afford the greatest possible satisfaction to our enemies. It would, in fact, be worth the enemy's while to have these raids every day of the week, and the result would be well worth their while if they knew what I have described would be the result of each attempt.

[A very wise outlook, and one which explains precisely why Zeppelin raids were of military value.—Ed.]

One other point, and it is the most important of all. It is, if warnings were given, would they have the effect of saving life? I am advised that they will not have that effect. Supposing we gave warnings by such means as loud-sounding hooters. I am advised that sudden warnings in this way of impending air raids would have the effect of overcrowding in the streets and trams, and people would suddenly crowd into the Tubes and other places, and this of itself might result in a serious loss of life. It is a wise and prudent thing to go under cover.


I know of one well-known house where a number of employees rushed out and the policeman exerted himself to drive them indoors, and he succeeded very well. Just afterwards a bomb exploded near to the house, and those people were saved. I do not at all close my mind upon the matter, but I wish to tell the House that the opinion of all the experts and of all the business men whom we have consulted is that upon the whole we are wisest, both from the point of view of carrying on the war and from the point of view of protecting life and the safety of persons, in not giving a general public warning by hooter or some means of that kind.

Mr. Joynson-Hicks: Could the right hon. gentleman at all events extend the warning to the hospitals? The London Hospital which treated 190 patients yesterday, had no warning whatever, and had no time to prepare.

Mr. Flavin: I was going to suggest that point. I think that public institutions, public schools where there are infants, and the hospitals, where there are wounded soldiers, ought to be warned.

Sir H. Dalziel: The Leader of the House informed us yesterday that one of the enemy raiders had been destroyed. Can the right hon. gentleman confirm that or add any information as to whether any other machines were brought down?

The Under Secretary of State for War (Mr. Macpherson):



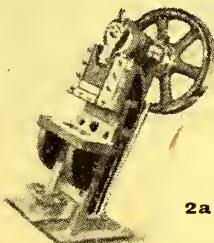
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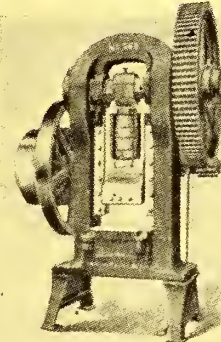
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Perhaps the House will allow me, in a few words, to reassure my hon. friend the Member for Brentford (Mr. Joynson-Hicks) that everything that is possible has been done, and is being done, to ensure the best possible defence for this city. I may tell my hon. friend, as I think he knows, that we have a good supply of the best available guns and the best available pilots who yesterday ascended the moment orders were given. As the House knows well, the raiders came across the Channel in about twelve minutes, and, as the Home Secretary has pointed out, on at least four or five occasions we were ready, and we never really know when they may come directly over London. With regard to the point raised by my right hon. friend the Member for Kirkcaldy (Sir H. Dalziel), I got definite information yesterday that one was brought down in the eastern part of Essex.

[The German communiqué says that a British machine was brought down, and that all theirs returned.—Ed.]

I am not going to enter into one of the points to which my hon. friend directed my attention—the point of reprisals. My hon. friend knows that is purely a question of policy for the Government, but we may assume that the raid which took place yesterday on London was merely a reprisal on the part of the Germans for the very continuous and effective raids which we ourselves have taken the precaution of inflicting upon them, particularly round about the dangerous area of Zeebrugge.

As my hon. friend, who has just paid a visit to the front, will realise, the amount of work which is being done by our very best pilots and our very best guns at the front may occasionally handicap the home defence. I can assure him upon this point that not only are we now satisfied that we have got the men, the aircraft guns, and the machines at the front suitable for very effective raiding and for very effective defensive purposes along the front and also in German territory, but we have at the present time a very good supply of men, and machines for home defence.

A SCENE IN THE HOUSE.

On June 15th, after Questions, Mr. Billing asked: Will the right hon. gentleman move the Adjournment of the House at 3 o'clock this afternoon or at some earlier hour to enable this House to debate the question of the desirability of reprisals upon Germany to prevent further action on their part?

Mr. Bonar Law: That is the last thing I would do.

Mr. Billing: Is the right hon. gentleman aware of the feeling in this country at the present minute in regard to the absolute weakness and apathy on the part of both the naval and military authorities—

Mr. Speaker: If the hon. Member has any questions to ask he must give notice of them in the usual way. The Clerk will now proceed to read the Orders of the day.

[MR. SPEAKER LEFT THE CHAIR.]

Mr. Billing: In view of the fact that there is no one in the Chair, perhaps I may be able to address the Leader of the House. Before we proceed with business I would like to ask the Leader of the House—

[MR. WHITLEY TOOK THE CHAIR.]

Mr. Billing: Before we proceed I would like to ask—[Order.]

The Chairman: Order, order! I call upon the hon. Member to resume his seat. [More interruption and cries of "Order."]

Mr. Billing: On a point of Order. I was anxious to address a question to the Leader of the House at the moment Mr. Speaker vacated the chair to proceed with other business. In these circumstances I presume I am in order in addressing the Leader of the House now. If I am not in order in addressing the Leader of the House now, I must refuse to give way.

The Chairman: The hon. Member is not in order. We are now in Committee on certain business.

Mr. Billing: I protest against this House proceeding in Committee with other business until we have had an undertaking from the Leader of the House. [Hon. Members: "Order, order."]

The Chairman: Does the hon. Member decline to respect the authority of the Chair?

Mr. Billing: I protest to the House. The authority of the Chair has been abused so often in my case that I must refuse to respect it. [Interruption.] I protest against this House proceeding in Committee until we have had an undertaking from the Leader of the House that an early opportunity will be given to debate the question of aircraft reprisals.

The Chairman: The hon. Member must resume his seat. I call upon the hon. Member to resume his seat.

Mr. Billing: May I have a reply from the Leader of the House before this House proceeds with business?

The Chairman: If the hon. Member declines to respect the authority of the Chair, then it is my duty to take other steps.

Mr. Billing: I am sorry if the other steps have to be taken, but in view of the exigencies—

The Chairman: I call the attention of the Committee to the action of the hon. Member for Hertfordshire in declining to respect the authority of the Chair, and I call upon him to withdraw.

Mr. Billing: I ask the Leader of the House whether he is prepared to make some statement so as to reassure—

Hon. Members: Name, name! Sit down!

The Chairman: Does the hon. Member persist in declining to respect the authority of the Chair?

Mr. Billing: While I have the utmost respect for your ruling, Mr. Whitley, I feel that I am not doing my duty to my Constituents and to this House unless I press this question.

The Chairman: I call upon the hon. Member to withdraw from the Committee.

Mr. Billing rose— [Hon. Members: "Order!" and "Name!"]

The Chairman: Order, order!

Mr. Billing: Am I entitled to ask the Leader of the House before I withdraw— [Interruption.]

The Chairman: If the hon. Member still persists, it is my duty to take further and more extreme steps.

Mr. Billing: That is up to you. [Interruption.]

The Chairman: The hon. Member is ordered to withdraw from the Committee.

The hon. Member thereupon withdrew.

GERMAN MORAL.

On June 18th, Mr. Bonar Law, replying to questions by Mr. Joynson-Hicks (Brentford, U.), Major Hunt (Shropshire, Ludlow, U.), Mr. Brookes (Mile End, U.), and Mr. Pemberton-Billing (Hertford, Ind.), said: It is a mistake to assume that air raiding is confined to the enemy. For the past year our Air Forces in France have raided the German communications, and all the military objectives behind the enemy's lines which were sufficiently important to justify the enterprise. With the increase of our Air Forces and the improvement in machines air raiding against objectives at longer ranges is becoming more practicable, and the Government are in consultation with the military authorities here and with the Commander-in-Chief in France as to the most effective method of dealing with the situation, but it is obviously undesirable to give warning to the enemy.

[When will Mr. Bonar Law begin to understand that raids on Belgian and French territory held by German troops do not in the least affect the moral of the German people? And that the destruction of one railway line of communication, which is repaired in a couple of hours, has far less effect than has the destruction of one munition factory which cannot be restored in three months? And that big munition works, and the dwellings of munition makers surrounding them, are much easier to hit than narrow railway lines and ammunition dumps?—Ed.]

Mr. Joynson-Hicks: Would my right hon. friend very shortly give an opportunity to the House of discussing the recent air raids and the preparedness in England with regard to them?

The Chancellor of the Exchequer: If there were a general desire in the House to discuss that or any other subject I should be bound to bow to it, but I do not think myself it is desirable.

Mr. Pemberton-Billing: Has the resolution passed at a London meeting yesterday been brought to the right hon. gentleman's notice, and does he not think that such a resolution from such a representative body should not receive the consideration of the Government?

The Chancellor of the Exchequer: It has been brought to the notice of the Prime Minister and to my notice as well. Of course, the subject is one that is engaging the most anxious attention of the Government.

Mr. Peto (Devizes, U.): Is it not a fact that the air raids which the right hon. gentleman spoke of in his answer have no resemblance whatever to the air raid over the East-end of London last Wednesday, and have the Government an open mind, subject to the advice of their military advisers as to the effect of it, as to complete retribution for that definite act of a totally different character?

The Chancellor of the Exchequer: The Government have a perfectly open mind in this sense—that we intend to take the steps that to us seem most effective, not merely for damaging the enemy, but preventing raids of this kind. (Cheers.)

Mr. Pemberton-Billing: Are we to understand there is no longer any question of principle in the mind of the Government as to whether we should have reprisals or not, but that it is purely a question of expediency?

Sir S. Collins (Lambeth, Kennington, L.): Do the Government think that if by aeroplanes they killed innocent women and babies it would help the situation at all?

[The killing of women and children reduces the fighting and feeding and manufacturing resources of the enemy.—Ed.]

Mr. Pemberton-Billing, at a later stage, asked leave to move the adjournment of the House in order to call attention as a definite matter of urgent public importance to the desirability of beginning a policy of air reprisals over enemy country without delay and of instituting a reasoned system of warnings. Only 10 members rose in support, but he claimed a division.

The figures were:—For the motion, 25, against 183—majority against, 158.

Mr. Pemberton-Billing rose and said, "Thank you, Mr. Speaker," and walked out of the House.

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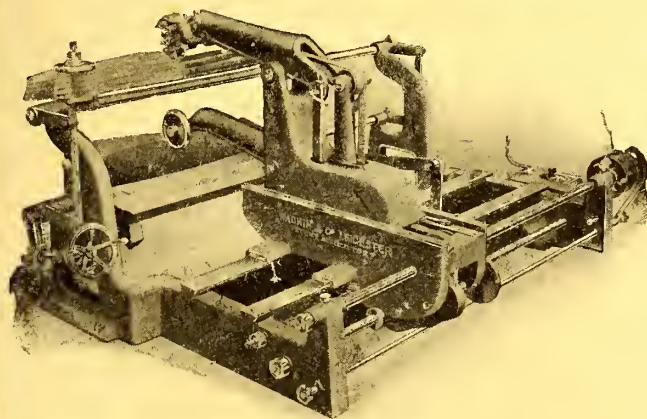
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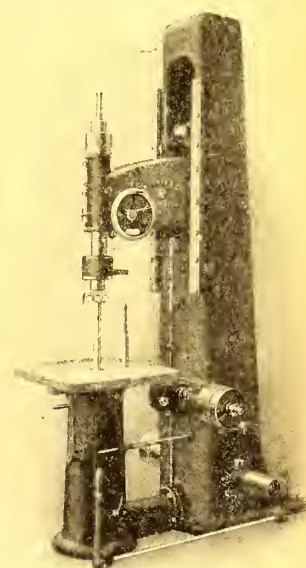
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KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.

A YEAR'S WORK OF THE AERONAUTICAL SOCIETY.

On June 13th the Aeronautical Society held its general meeting, when the following members were elected to the Council:—

Mr. A. Berriman.	Mr. Holt Thomas.
Wing Comdr. W. Briggs, R.N.	Wing Comdr. Ogilvie, R.N.
Mr. Bertram Cooper.	Lieut.-Col. Mervyn O'Gorman.
Mr. Handley Page.	Lieut. A. P. Thurston, D.Sc.

As the general meeting officially terminates a year's work of the Aeronautical Society, it seems an opportune moment at which to review the Society's work.

The past year has been one not only of exceptional activity of the Society, but of extremely gratifying success. At the beginning of the war the Society had 400 members, and at the end of the following year this number was reduced to about 330.

During the past year the membership has increased to 550, and at the present moment is increasing still more rapidly, practically all the influx having taken place since January.

One of the outstanding actions of the Council of the Society has been to form a Standing Joint Committee with the Society of British Aircraft Constructors. This is the first example of such a committee being formed between a trade society and a scientific society, and is an example which might well be followed by other learned societies. This Standing Committee meets once a fortnight, and through it scientific data acquired by the Society is communicated to the trade, and problems which crop up in the trade are communicated to the Society with highly beneficial results to all concerned. It is well to point out that so far the science of aeronautics has not become a pure science, but is rather an applied science.

Furthermore, the work of the Society is rapidly becoming educational, so that the Society in itself is coming to partake rather of the nature of an institute than of a purely scientific body. Incidentally, it may be well at this point to draw attention to all interested in aeronautical affairs that there is no connection whatever between the Aeronautical Society and a recently formed concern known as the Aeronautical Institute.

The Aeronautical Society has always had in it a large non-technical element, consisting of people who are keenly interested in aeronautics, but are not actively concerned either in construction or in investigation. Hitherto the membership has been divided into three classes; (a) Members, who are non-technical; (b) Associate Fellows, who have direct claim to technical knowledge; and (c) Fellows, who are elected on account of their technical distinction.

This arrangement, however, is not in line with that of other learned Societies and steps have been taken during the past year so to arrange matters that the membership may be divided, so that the titles may correspond to those of such bodies as the Civil and Mechanical Engineering Society.

Distinguished members of other societies have helped the Council on this question, and the American system has been studied.

It has now been recommended by the Council that the membership shall be divided into (a) Hon. Fellows, elected on account of some particular scientific distinction; (b) Fellows, elected for scientific distinction; (c) Members, elected on account of technical qualifications; (d) Students, elected on account of technical qualifications on the understanding that in a stated time they qualify to become members, and (e) Associates, who may join the Society without technical qualifications.

Classes a, b, and c are qualified to vote on the management of the Society's affairs, and Classes d and e are not. The Society as a whole has yet to express its approval of this suggestion.

Under the old system it was customary to elect Associate Fellows and Fellows by vote of the whole membership, but the number of people qualified to vote is now so large that an enormous amount of correspondence would be involved, and therefore at the recently held annual general meeting it was decided that in future the Council shall elect the members and Fellows in a manner similar to that in operation in all other learned societies.

The customary method, one understands, is that the Council shall at its regular meetings elect these persons, and that their election shall be confirmed at the next ordinary meeting of the Society. For instance, the names of those elected by the Council during a certain week would be read out by the chairman at the next lecture given before the Society, and would be automatically passed unless there were some particular objection to an individual, which could then be stated. This system of reorganisation is actually working towards a combination of an aeronautical society and an institution, and is in fact trending towards a formation on the lines of the British Association.

The Society is now in close touch with the new Government Department of Scientific Research which was at first under the Board of Education and is now a separate department under Sir Frank Heath. This department has a Government grant of £1,000,000 per annum to spend on research, and it is hoped that a due proportion of the amount may be allocated to aeronautical research under the direction of the Council of the Aeronautical Society. Under this new scheme the Government wishes Boards of Industries to suggest programmes of research, and is then

prepared to give grants up to as much as cent. per cent. of the money put up for research by the industries concerned. These Boards of Industries consist of representatives of capital, labour, production and science concerned with the particular industry, and such a Board will be formed by the Aircraft Industry.

The lines of research are now being considered by the Standing Joint Committee of the S.B.A.C. and Aeronautical Society, and it is expected that research will be along the lines of commercial possibilities rather than for warlike purposes, as the Flying Services already do their own scientific research.

A Special Committee of the Aeronautical Society has already discussed and drawn up tables of subjects for research, and this is now before the Standing Joint Committee. It is understood, however, that the Department of Scientific Research is quite ready to help the Scientific Societies on their own account apart from Boards of Industries, and to pay the cost of such scientific investigation as may be considered worth while, and the Aeronautical Society is now becoming such a scientific society.

The Aeronautical Society is also working in with the Royal Aero Club wherever their interests touch one another, and it is suggested that a Joint Library Committee might be formed.

The finance of the Aeronautical Society is now in a very satisfactory condition, and it is now in a position to invest £1,000, and still has several hundreds left over for ordinary working expenses. This investment consolidates all fixed payments, such as life membership fees and entrance fees, the former investments of the Society, of course, the "Wilbur Wright" and "Busk" funds, being earmarked specifically as trust funds.

The lectures given before the Society during the past six or eight months have been of the very highest interest, especially in view of the very distinct limitations imposed on public lecturers in war time, and the greatest credit is due to the lecturers, who, despite the cramping of their style by the necessity for not divulging anything that might convey information to the enemy, have, nevertheless, had a highly educative influence on many thousands of new-comers to the Industry.

At one time or another several hundreds of readers of THE AEROPLANE, who do not belong to the Aeronautical Society, must have attended these lectures, besides some tens of thousands who have afterwards read the lectures in this paper. Therefore, one has no compunction in saying plainly that there have been a great deal too many "dead-heads" at the lectures. And one might even suggest that thousands of readers of this paper, who profit by the generosity of the Society in allowing the lectures to be printed so fully, are themselves morally "dead-heads."

One would, therefore, most strongly advocate that all readers of THE AEROPLANE, who are interested in aeronautics, should become Associates of the Aeronautical Society, especially as the subscription for an Associate is only one guinea.

An individual must be very feebly interested in aeronautics if he grudges paying one guinea a year towards the support of a Society which has done so much for aeronautics.

Besides what one might call the G.H.Q. lectures of the Society, very interesting series of lectures have been given at Hendon by arrangement with Mr. Handley Page, who placed a hall at the disposal of the Society free of charge. These lectures taking place in the midst of an aircraft community drew an audience of about 400 people every evening, and such an attendance surely indicates the enormous number of Students or Associates who ought to belong to the Society.

A similar series of student lectures was arranged at Cardiff at the request of the Technical Education Committee, and these were organised by Mr. Bertram Cooper, until recently Secretary of the Society. Although Cardiff is not an aeronautical centre, the attendance was uncommonly good, and the success of these two series indicates further success for similar series of lectures.

It has been suggested that lectures of a similar nature should be given at individual factories where a sufficient number of men are employed on aircraft work.

The good that may be done in such a way is apparently realised even by the Air Board, as one gathers that lectures have been arranged in factories with the approval of the Air Board, the said lectures being chiefly on the work done by the locally built machines or engines at the Front, and delivered by officers or men of the R.F.C. who have actually used such machines.

An interesting suggestion has been made by a member of the Council of the Aeronautical Society to the effect that meetings for students only should be organised in various aircraft centres, and that the students should be left alone to debate aeronautical subjects among themselves. This is a wholly excellent idea, because young men in the Industry would find the courage to get up and talk among themselves when they would be too bashful—or, at any rate, the most desirable kind of youngster would be—to get up and talk in the presence of their seniors.

One feels sure that if this suggestion were adopted a very much larger number of students would be induced to join.

Finally, one would like to congratulate the Society very heartily on the excellent work which has been done during the past year, especially on the sound way in which it has accepted aeronautical science as being essentially a matter for practical men, and has not become subservient to the slide rule or the microscope.—C. G. G.

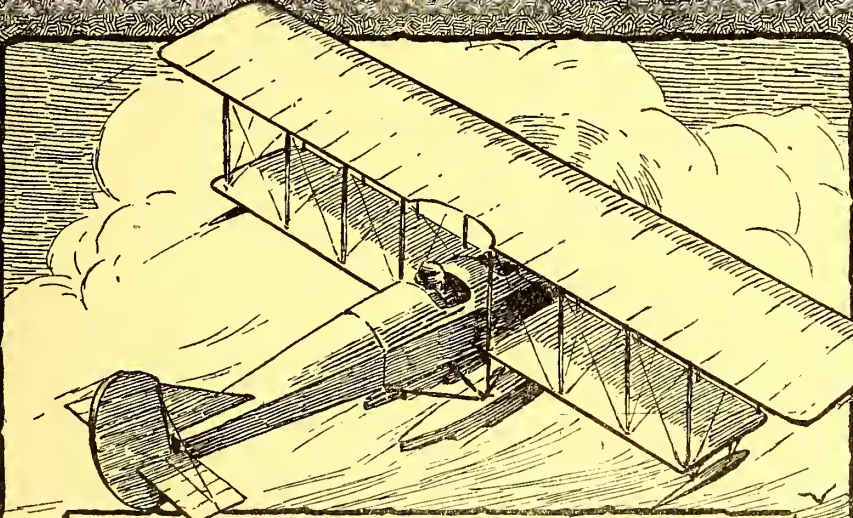
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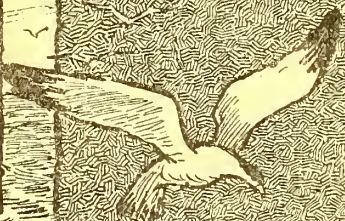
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The Fifth Wilbur Wright Memorial Lecture.

"LOOKING AHEAD."

BY LIEUTENANT-COLONEL MERVYN O'GORMAN, C.B.

The annual Wilbur Wright Memorial Lecture to the Aeronautical Society was delivered on June 13th at the Grafton Galleries by Lieut.-Colonel Mervyn O'Gorman, C.B. A notice at the entrance to the Galleries announced that General Sir Francis Lloyd, Commanding the London Area, had been pleased to place the Grafton Galleries in bounds for officers on this occasion. Apparently the placing out of bounds had been forgotten when locating the lecture.

The Wilbur Wright Lecture is rightly intended to be the most important lecture delivered to the Society each year, and one can say quite frankly that never has a more thoroughly excellent lecture, Wilbur Wright or other, been delivered to the Society than that on Wednesday last. As Lieut.-Colonel O'Gorman explained, the title had been changed from "Foresight in Aeronautics, Technical, Political and Military," to the more non-committal, or, at any rate, less controversial title, "Looking Ahead."

It is deeply to be regretted that less people were present than might have been expected, and that the lecture was practically ignored by the lay Press next day, for the matter of the lecture gave evidence not only of remarkable foresight for the future, but of a clear and concise method of reasoning which convinced one as to the correctness of the views expressed therein, and of the methods of thought by which those views had come into being. On a few points one felt inclined to disagree with the lecturer, but rather on matters of policy than on matters of fact, and the present writer has ventured to interpolate in the report of the lecture itself a few arguments in opposition to or diverging from one important point raised by the lecturer.

OPENING REMARKS.

The proceedings were opened by General Ruck, Chairman of the Aeronautical Society, who announced the result of the election for Members of the Council which had taken place during the afternoon. General Ruck said that in the unavoidable absence of Lord Sydenham, the Society was fortunate in obtaining as Chairman at the meeting Major Dodd, Chief Aviation Officer to the United States Expeditionary Force under General Pershing. It would be impossible to find a more suitable Chairman, as his presence gave the Society the opportunity of expressing their appreciation of the action of the United States in joining the Allies, and also of honouring in an American officer the memory of that great American, Wilbur Wright.

GENERAL RUCK gave a brief history of the genesis of the Wilbur Wright Lecture, and related how the two brothers had been elected Fellows of the Society. He welcomed Major Dodd as a representative of the Air Services of the United States, and, on behalf of the Society, offered to him all the assistance the Society could give to the Air Services of our new Ally. The audience at this point expressed their approval of the Chairman's sentiments in a manner unusually prolonged and hearty for the Members of so staid and sober a Society.

GENERAL RUCK, referring to that morning's air raid, pointed out that Major Dodd had arrived at an opportune moment to witness the enemy's method of carrying on aerial war, and he asked him to judge by his knowledge of the R.F.C. method of carrying on aerial war in France which method was more likely to win the war. Apropos prophesying as to the winning of the war, he said that he had just come across an old newspaper record of 1866, the year of the foundation of the Society, apparently written by some crank who had been studying Revelations. The writer of this curious prophecy foretold a great war about this period, and said that it would last for precisely forty-five years, so now we knew exactly when the war was going to end. The future possibilities of aviation concerned this country and America equally, and nothing could help progress more than knowledge gained in the face of the enemy.

MAJOR DODD, who, on rising, was received with acclamation, expressed modestly his pleasure in accepting the Chairmanship of the meeting. He said that there was a feeling in the States that the result of the war would be largely determined by aircraft. Having had no time to put his ideas into crystallised form, he would at once call upon Colonel O'Gorman to deliver the lecture.

THE LECTURE.

COLONEL O'GORMAN said:—Mr. President, Ladies and Gentlemen,—I thank you and the Society's Council for the invitation to deliver this the fifth lecture in memory of Wilbur Wright, the man of foresight who gave 12 years of his life to unrecognised toil, who, after a further 10 years, is fully acknowledged as a far-seeing and sane experimenter. We are proud that he was a member of this the earliest of all Aeronautical Societies of the world, and we hope to carry to yet greater things the consequences of his great achievement. To do this we must now and then look ahead.

For nearly three years aeronautical engineers have been working under intense pressure on a multiplicity of details of design and production. Many have thereby been forced away from their normal wide outlook and habit of detached thinking—unless fumbling for a bus fare be a mode of thought. Our minds have been moving forward as strap-hangers are moved forward by the train amidst an intolerable crowd of immediate calls, while the general survey of the horizon—the trend of the past, the prospects of the future—has been obscured by the crowd.

I will not say that "aeronautics is in its infancy"; that phrase comes up like a cork, and also produces the effect of a cork which fails to pop, the suspicion that there is no sparkle to follow, but we will consider that demand for foresight which is made by the world upon the engineer. The engineer himself omitted it from his definition of his function in 1827, and has continued to omit it ever since that date when the Charter of the Institution of Civil Engineers was drawn up. Yet it is the most insistent call we have to meet, amounting almost to a demand for prescience.

It was General Scott Moncrieff, himself a distinguished R.E., who originated the reply "I am an engineer, not a prophet," when too searching demands were made upon him by the Army Finance Branch as to the outcome of some scheme, and there are few who have had control of engineering works on the larger scale who would not have been glad to get relief from the tax on their prescience if it could be got by borrowing this dictum. Every estimate, tender, specification, contract is such a tax; every design, preliminary experiment, tool, and jig equipment for output is an expression of the effort to foresee the position some six or twelve months ahead. We are now, however, seeking an outlook on a wider gap than this, so let us step back to spring clear.

A DIET OF HOPE.

Aeronautical engineers have lived for many years on a diet of hope, exercising their imagination and stimulating others to look ahead; hence, they can realise with exceptional clarity, how foresight may become dormant in busy men, and so be led back to ask themselves, "Now that we are busy, are we as wide awake as we were?" "Do we now pause to look 10 years ahead as we used to do?" I believe that until Mr. Holt Thomas's lecture the answer from the aeronautical world at large was "No."

Of course, our aeronautical world includes both the Air Services, and also financial persons, as well as civil engineers. In the Services the routine of life calls mainly for the very different mental effort of *rapid decision*. Yet this is not a diametrical opposite, for these decisions will be unsound if there has not been thinking in anticipation, and in war we see how the higher commands are pitched into the "foreseeing business." The military organiser must be among the prophets and not least in the matter of the purchases to determine on.

The financier should be *par excellence* a seer. He deals in credit and in confidence. He should be clear-sighted enough to know when to take a risk. Those who think he would be more useful if he were more gullible are deeply wrong; that would be disastrous. What we wanted both from him and from the purchaser in the days of our early struggles was foresight. The proof that it was lacking is that aeronautics unquestionably found money and orders too hard to get in the past.*

This, on the one hand, arose from the fact (which has in other ways been of priceless service to us in the war) that our banks are mainly engaged in *deposit banking*, rather than in taking part share in developing newly-fledged industries, after the style of the industrial banks abroad†; while, on the other, the Services, who were the purchasers, were and are tied to peculiar Parliamentary adjuncts.

*It is remarkable that we were then investing one-fourth of our national income abroad—our foreign and colonial investment represents about a capital of 4,000 millions, so there was no insuperable difficulty in getting money. (E. Crammond in "Civil Engineer," March 12th, 1917).

† This is no place for developing the contrast between bankers methods at home and abroad, but for a brief *exposé* of one point of view reference may be made to the "Round Table" of December, 1916. Certain reasons which were, before the war, gradually forcing the German Banks towards the "Deposit Bank" point of view are also there shown. It is something to be the trusted money centre of the world. Nevertheless, the "Industrial Banks" had moved mountains, and we find on May 16th, 1917, that a British £10,000,000 "Trade Corporation" has been granted a Charter for some such industrial purposes, and is now under hot discussion in the House.

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THE PARLIAMENTARY FINANCIER.

These adjuncts are another kind of financial person from that first indicated. Aeronautics, military and naval, have been and will be closely concerned with them. These are not courageous "gentlemen adventurers," to use the old phrase; they themselves would say they are the antithesis thereof. Anyhow, the country's money is not entrusted to financiers in the usual sense—a name for those who weigh a risk against a profit and take both.

Rather it is in the hands of anti-spending organisms with an astonishing aptitude for evading money risk. In the wider world it is axiomatic that no progress can be made without venturing forth, but we have had no State Department instructed so to venture; indeed, it is almost incompatible with the strict annual accountability exacted from Army spending departments in most democracies.

One could quote a luminous address delivered to the Staff College by Sir Charles Harris, K.C.B., the head of the Army thrift for 25 years, to show that to succeed in *not spending* is the gauge of effectiveness for such a branch provided the Army is carried on for the year under review. In view of the object for which it is instituted he must be right. This, of course, is a different thing from financing a development. It felt different.

But we can learn from the past. On almost any tree it is possible to notice that its branches are a diagrammatic record of their early struggles towards the light. Their crookedness is ascribable both to the early errors and the correction of the earlier errors as to which was the best direction in which to shoot. They are a record of lost time, of changes of effort, of delays, and, therefore, to us, who may be thinking of an analogy in aeronautics, of regrets.

For British aeronautics to-day carry just such an impress of primitive struggles and mistakes, and the question arises whether we can learn and whether we are now unwittingly, as we were then unwittingly, misguided by prejudices, our own and others? A point of view is prejudiced when it is held with a tenacity which is in excess of that warranted by the evidence. Let us consider some notions of the past.

EARLY ERRORS.

Memories are so short that our instinct is to deny as a body that we delayed our own progress by early errors of our own outlook, particularly as we were so acutely conscious of and so busy combating the errors, obstinacies, and prejudices of others. I can well believe that most members have forgotten the almost unanimous opposition which existed to the idea of forcing up the speed of Service aeroplanes* to the level of the "stunt" aircraft of the time as recently as 1910.

Even 72 miles an hour was taboo! A little prior to that there was a fairly widespread insistence upon flying with the minimum possible engine, and one of our British pioneers so far succeeded as to achieve flight with about 10 h.p., a performance in itself a record and highly creditable.†

Quite common in 1911-12 was the conviction that flying for an hour at such a height as 4,500 ft. (to-day the easy achievement of every junior with less than 20 hours' flying experience) was a monstrous test to impose.‡

You will, I think, sadly recall the wastage of small fortunes on wing-shapes which had no attraction that was even arguable except their singularity§ and the unregulated gusty enthusiasms which at one time favoured all monoplanes to the exclusion of other arrangements,¶ or later still which, in order to favour bigness and twin engines began to despise the small craft,** or, later yet, what may prove to be a regrettable revulsion against big craft.

PREJUDICES.

You may remember the furore for steel tubular construction (I was myself a victim); harmless it might be said in itself, but pernicious in that it was commonly accompanied by a prejudice against the use of wood. There have also been prejudices for and against the rotary engine, for and against pusher aeroplanes, for and against warping wings to the exclusion of wing flaps, etc., etc.

It is to be noted that as opinions, zealously pursued and tested, the views in themselves were a stimulus to useful experiments, but the prejudice which was imported against the alternative courses were nearly always narrow and pernicious to our progress and the very reverse of foresight.

* I except Mr. Lanchester, and also claim to have escaped this one particular error. See Inst. Auto. Engrs., page 219, para. 75, "Problems Relating to Aircraft."

† Mr. A. V. Roe to whom great credit is due for this by no means unconstructive "Record."

‡ But for this error we might years ago have got clear of the main aero-carburettor problems of to-day.

§ The basic trouble here was the disregard of the wind tunnels of Eiffel, and the N.P.L. Prandtl and Riabouchinski.

¶ Notably the tractor biplane to which again Mr. A. V. Roe was the British exponent, and Bréguet the French.

** This phase was worse in France than in England, but it was significant even here.

This brings us to the more ticklish matter of the prejudices ruling to-day. There is a character of H. G. Wells's who says that a young lady's path is "beset with pitfalls prowling about." That represents also the peril of one who ascribes to prejudice what others may have installed as part of their doxy. Let me paraphrase the definition hazarded earlier, that a prejudice (which may be either right or wrong) is a view strongly held upon a weak proof—and proceed to some general examples.

MORE PREJUDICES.

I suggest that there is a prejudice in the matter of a low price for labour; it is also held that *destroying goods* is in the interest of trade and good for securing wages to labour. It is a common prejudice to believe that if one firm makes a splendid scientific step and thrives accordingly, that it is bad for others in the same trade. British airships—the 40-hour air-scouts for the Fleet—were killed by public prejudice. There is possibly more prejudice than proof at the root of our neglect to found any hopes on soaring flight.

The wind tunnel and its priceless contributions to flight have been decried from prejudice—not proof.

The method of trial and error called rule of thumb has been set up as the antagonist to studied design on similar grounds. I believe every exponent of this antagonism is an opponent of progress.

There are prejudices against stability, and against the use of factors of strength in aircraft design, and against the possibility of combining controllability with stability. I am told that there are still prejudices against big aeroplanes and on the subject of the best number of engines to install. Amongst the notable prejudices of the war is one which declares that German aircraft were and are better than ours on the average, class for class, and that the exceptional German aircraft was better than the exceptional British. There have been astonishing prejudices as to the efficacy of certain bomb-sights and the utility of thin armour.

There is a wide class of prejudice fostered by catch words, generally detached from their qualifying context—the "inevitable survival of the fittest" is the common example. Thus "competition is good for trade," when unqualified, is a dangerous prejudice of which I hope to give an example.

In technical studies there is a widespread prejudice against "overlapping." I regard "overlapping" as the useful free and independent study of the same subject by different intelligencies, and invite you to note that overlapping research is the root of some of the finest engineering advances in industrial life, and of the finest scientific progress, as well as one of the chief excuses for the statement that "competition is good for trade." The word "fog" is in danger of becoming a catch word for prejudice against aeronautical development.

I have been told of the existence of prejudice against gravity-controlled air-speed indicators and against a certain oval sectioned aeroplane wire. I believe there is a prejudice against the use of instruments when teaching flying, and run the risk of being called prejudiced for saying so. There was a prejudice against the registration of private motor-cars, and there is danger of one as regards aeroplanes.

You will remember the yokel who remarked as he ground his heel into a useful little creature who could not answer back—"I'll larn ye to be a toad." I have seen similar prejudice against other unoffending workers. None of these things are good for progress. There are outside of this Society, and perhaps within it also, prejudices on the subject of vertical rising flying machines, and I think there have been recent prejudices on the subject of dope, shock tests for steel, the use of welding, etc. etc.

ACTION AND REACTION.

I hope that these few suggestions, even if some of them are wrong, will be taken in good part, for the sake of the moral.

For if any one, and still more if several, of these convictions were erroneous and were to be held to be certainly correct, we should be led to the definite avoidance of a particular line of construction, or performance, or study, and to the adoption of its opposite number. For a brief moment this flush of popularity would benefit the happy enthusiast whose choice was selected, even if he were mistaken, but the kink taken by British aeronautics would react to his and everybody's eventual detriment.

We may say that so long as no preponderating prejudice leads us *all together* in the same wrong direction, these prejudices only operate as the varied enthusiasms which make for the more thorough exploration of some corner of our immense field of inquiry and at the cost of some little delay give rise to a very definite new knowledge and certainty. However, it would be a grave lack of foresight not to remember that we are relying upon the mere chance that the lack of interdependence among individuals will save us.

When prejudices are rife we are staking our safety on the survival of our own "cussedness"—a very slender safeguard against the "all together" tendency which every socially-united

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community is more and more drawn to, the more in proportion as it is more closely knit and organised.

The remedy, the insurance against this risk, is provided in the existence of the individual constructor healthily overlapping in his studies those of his friends and rivals, and in the free discussions which our Society provides, with occasions for now and then taking stock of our position, past and present, with a broad philosophic mind.

"ALL-TOGETHER" PREJUDICE.

I would venture on one example, now sufficiently far back in date to be quoted without raising any feeling, of a dangerous run of prejudice from which we have escaped only with pain. I allude to the time when almost the whole British aeroplane industry centred its efforts on the monoplane when it was as possible then, as it is now, to see that the girder structure of the biplane lent to it specific advantages for at least some types of aircraft. It was a rude shock when this mono mania, or monoplane mania, was brought up to a standstill.

One of the evils of this is quite possibly the reaction which set in and enabled Mr. Besnard, the French Air Minister, to say lately with apparent satisfaction that he had not got a single monoplane, yet I doubt if he has seen, and certainly I have not yet heard of, any technical study which has established that this compact type of machine has not still got many useful fields.

You are probably aware that a danger nearly as great threatened French aeronautics over the big multi-engined machine as lately as within the war period. They almost stayed all other advances in favour of these large aircraft. Our industry having in each country a sole purchaser, the Government, suffers the risk of an "all-together" prejudice more greatly than ever did the automobile or shipbuilding industries with their various outlets and various demands and various supplies of funds.

Neither of these runs of prejudice actually brought the trade to a standstill, but we have herein a lesson which some of those, and they are very numerous, in Socialistic centres who believe in the exclusive State control of all capital and industry might usefully take to heart.

INDEPENDENT PURCHASERS.

This brings us to the great future in which the aeronautical industry will have the benefit of totally independent purchasers—commercial aeronautics. Commercial aeronautics is clearly one of the subjects to which I have alluded as requiring foresight, technical, political and financial. Broadly, the objective is simple, in detail it is very complex. This at once suggests analysis as a help towards foresight.

Commercial aeronautics can be divided into three parts:—

- (a) The home or internal aspect.
- (b) The foreign or international aspect.
- (c) The Imperial and Colonial aspect.

The internal British question can be resolved into five separate subject-matters for study, and as each of these has sub-heads, I tabulate as follows, drawing attention to the two main heads—(1) the production, and (2) the utilisation (or "aerial transit") problems, corresponding roughly to supply and demand.

It is best not to discuss these heads till we have also analysed the international and Colonial questions into sub-heads. It will be found that the profitable use of aircraft is based on speed, and that as speed of transit includes door-to-door movements, if there are, as we see at present, considerable terminal time losses, the longer the distance over which aerial work is conducted the less significant are the "terminal charges" upon time of transit.

This merit introduces, for a small country, the advisability of studying flight beyond its borders, and for an island the consideration that shipping is slow compared to the railway or motor car. Therefore international flying will come up early in our development of aerial transit, and may be expected to concern movements over the sea, not necessarily in seaplanes.

FLYING ABROAD.

But you cannot go abroad without your tickets, your circular notes and passport, so you cannot fly over another country without making arrangements. These arrangements will be easily made if there is a body of opinion abroad which is favourable, which recognises that it will not get landing rights in British Possessions unless British aircraft have landing rights on foreign soil. One of many ways of securing such a body of opinion favourable to aerial transportation in the foreign lands themselves is to institute industrial links between our own constructors and foreign constructors, whether as "succursales" or joint firms, or shareholders or agents. I therefore put these first and tabulate five sub-heads. (See Table A.)

If we develop our aircraft making and using properly we shall be the first to wish that other countries may be equipped with "aerial ways" (lines of landing grounds), aerodromes at big centres of industry, finance or pleasure. Moreover, we want to find elsewhere not only the maps, but also most of the safety provisions desirable at home.

All these things will be fostered by the energies of societies like the Aeronautical Society and the Society of British Aircraft Constructors, which we should like to find abroad and enter into relations with. At present they are not nearly as active abroad as we are at home. They might be fostered not only officially, but rather through the intermediary of our *industrially-linked firms*, whether for construction or transit.

CUT-THROAT COMPETITION.

One of the important matters for consideration is the avoidance of cut-throat competition at a time when it is always difficult to ensure a remunerative investment with any certainty. This involves the inter-State provision of what may be termed limited monopoly for certain services—at least, until the businesses are well launched, and till statistics exist in which insurance operations can be satisfactorily based.

Firms can be trusted to make their own value felt by the Post Office and by passengers whom they desire to attract, but they are defenceless against one another if, as soon as one energetic individual has initiated an enterprise, the value of his strenuous work is to be poached upon by irresponsible persons, who may, it is true, ruin themselves undeveloped, but who may drag into a like ruin those whose industry and courage founded the whole scheme. The Government should step in here in the interest of maintaining what it must maintain, a large, successful and enterprising industry.

It may here be worth while to say why this country *must* do this. It is a matter of economy. The Air Fleet differs materially from the Sea Fleet in being more rapidly expendible. No one would dream of rebuilding the British Fleet six or eight times per year of war. Yet the Air Fleet requires at least this. Thus the aeroplane occupies an exciting position half-way between a battleship and a cartridge.

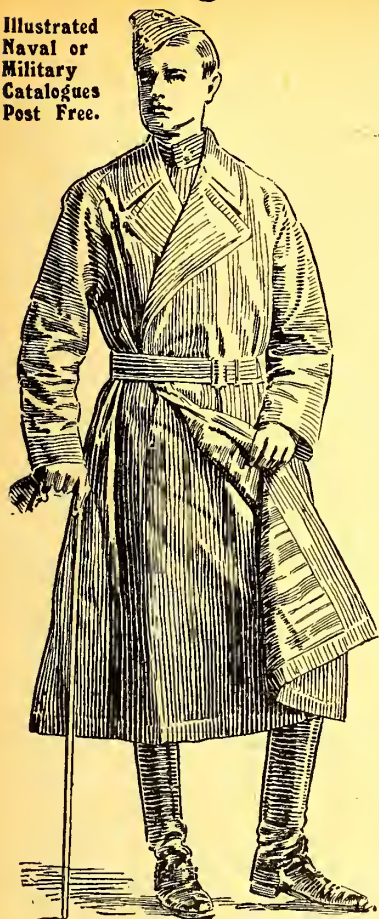
To decide on having an Air Fleet for war is synonymous with having an aircraft industry in peace competent to produce some eight air fleets per annum when called upon.

TABLE A.
INTERNAL (BRITISH) AERONAUTICS.

The Uses of Aircraft.	The Safety Provision.	Education of Personnel.	Production of Aircraft.	Labour.
(a) Transit of goods.	(a) Aerial routes and lines of landing grounds, maps.	(a) Designers and engineers.	(a) Best employment of existing factory organisation.	General Question.
(b) Transit of letters.	(b) Night flying and landing.	(b) Fliers and navigators.	(b) Finance and subsidies to makers.	(a) Skilled and unskilled.
(c) Transit of persons.	(c) Aerology and meteorology.	(c) Military call on fliers.	(c) Military and naval requirements.	(b) Male and female, including military, wounded, pensioned, etc.
(d) Labour of transit service.	(d) Wireless communication of distress, orders and signals of directions.	(d) Polytechnic and correspondence schools for labour.	(d) Publicity and "load curve orders."	
(e) Finance of Trans-aerial Companies.	(e) Labour of ground upkeep, etc.	(e) Subvention of education.	(e) Utilisation of over-plus of military and naval war orders.	
(f) Government subvention of aerial transport.	(f) Subvention of safety precautions and grounds.	(f) Collation of data, research.	(f) Supply of aircraft to foreign Governments and Colonies.	
(g) Private, sporting, and domestic use.	(g) Accidents investigation.	(g) Inventions.		
(h) Scientific use, surveys, etc.	(h) Keeping of records.	(h) Consular trade information, etc.		
	(i) Insurance of (1) pilots; (2) passengers; (3) craft.			

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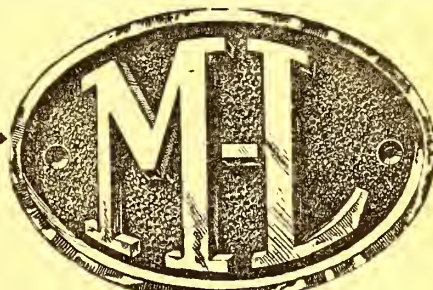
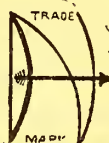
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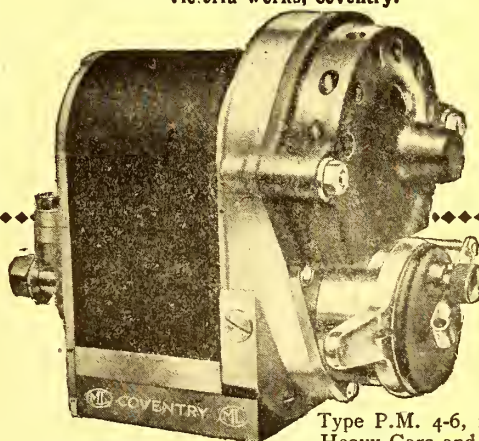
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The question "What industries are essential to the future safety of the nation, and what steps should be taken to maintain or establish them?" was set to Lord Balfour of Burleigh's Committee. The reply, though only a general one was given by the Committee, certainly must be taken to include aeronautics not only as a key industry, but as an industry the growth of which is necessary to the formation of pilots and the full maintenance of their "weapons" at the abnormal rate which results from war wastage.

The Committee's reply included the following phrase: "We consider that special steps must be taken to stimulate the production of . . . manufactured articles within the Empire wherever this expansion and production is possible and economically desirable for the safety and welfare of the Empire as a whole."

The necessity for special steps being taken to preserve and expand the production of aircraft is scarcely open to question.

When we seek for what kind of special steps are, on the one hand, likely to win the support both of Protectionist and Free Trade voters, and on the other are sanctified by precedent and analogy, we can probably find suitable stepping stones through the marsh of the old controversies. One suggestion is the subventing of specific air-carrying trades, postal and other, on terms, so that on the one hand the public gets something for its money and gets a supply of pilots against a war demand, and on the other hand the aircraft producer gets orders.

There is precedent for this in the mail-carrying business, and there are also valuable foreign precedents and analogies.

It is obvious that the exclusion of foreign aircraft from the right to alight on these shores is not compatible with our expectation or our demand for the rights of alighting on foreign soil. Similarly, heavy port dues or landing dues are objectionable—for if we mean to build up the biggest Air Fleet we should probably pay out to foreign Governments the biggest total of port dues even if their scale is the same as ours. It is submitted as worthy of consideration that our interest lies in the direction of the smallest possible alighting tax provided reciprocity is secured or approximated to.

This therefore points to another form in which support may be given by the Government to the industry—the relieving of alighting grounds of part of the burden of rent, maintenance, night lighting, etc.—and this can, not improbably, be achieved in such a manner as to secure for the taxpayer the direct *quid pro quo* dear to the finance branches, by providing that a certain amount of accommodation shall remain always available for Service pilots.

Subvention of aeronautics need not by any means be limited to cash payments as subsidies to producers. It is amply clear that the formation of a chain of alighting grounds from big centre to big centre, if suitably chosen, may be made so as practically to abolish the risk of forced landings—in the current sense—that such a chain of grounds must be a high source of economy in machines and men to the State which is perennially conducting its air service training and manœuvres, and that the greater our private aerial locomotion business becomes the greater is the money value of such insurances against accidents.*

How to arrange that the owner of the alighting fields shall be able to graze them, manure them, etc., at certain times, or otherwise to derive value from them without imperilling the fliers in any way, together with the institution of suitable markings, is a matter for careful study, and such study will no doubt be conducted by using to the utmost the existing organisations such as this Society and its ally, the S.B.A.C.

It is certain that an industry sufficient only to build the aircraft

needed by the Services in peace time cannot possibly be large enough or "live" enough to meet the heavy depreciation of war, even at the outset, or even for a short war.

The established Army system of keeping a "mobilisation store" of goods which are for ever untouched, and are kept in readiness and up to date for the emergency of war, is not applicable in its simplest form to an apparatus so quickly antiquated and so rapidly perishable, even when not in use, as an aeroplane. Hence large constructional works must be kept in being, and they can only be kept going economically by being profitably employed, and this in turn demands that there shall be a full "turnover."

ASSURING CAPITAL.

So soon as this is known to be decided on, capital will flow into both the aircraft production industry and the aircraft transit industry from all sorts of private channels, to the great profit of the State.

One way of securing this "turnover" has been indicated in the supply for "transaerien" companies; another is the supply of craft to foreign Governments, much as we supply battleships or guns in time of peace. What we owe to this policy in the matter of shipbuilding is almost unthinkable. The business of assisting the aircraft producer to this end is one which calls for the wisest and most far-seeing policy—one step at least of this policy is in our hands.

The short-sighted and ignorant booming of German machines should be stopped now, not arbitrarily, but by the simple dictates of truth, and if for no other reason, to avoid discouraging our fliers at the front.

A DISAGREEMENT IN PARENTHESES.

[Here, and here alone, one disagrees absolutely with Colonel O'Gorman. As an Irishman, and a remarkably clever Irishman at that, he must recognise the fact that the only way to instil life into an Englishman is to scare him to death, and so the only way to liven up those responsible for aeronautical supplies was to hammer into them the fact that the Germans had in use at certain times aeroplanes which were better than ours in performance, though far worse theoretically. He must remember that "we have never been less than six months in front of the Germans in design, and never less than twelve months behind in delivery."

It has always been true that the best British aeroplanes have been better than the best Germans, but our best have been in England in ones and twos when they ought to have been in France in hundreds. That is where we have failed. Our energies have been wasted on building thousands of inferior officially designed machines instead of being properly employed in reproducing rapidly the best designs—irrespective of their source.

The "booming" of the German machines came from those who had to face them on inferior mounts, and results justified every word ever said on the subject. Even to-day one could point out vast room for improvement in the supply of aircraft to both Services, and we shall have all the old outcry over again unless things are taken in hand quickly at the Air Board Office.

—C. G. G.]

COMMERCIAL AERONAUTICS.

Commercial aeronautics is bound up with using the values which accrue incidentally to the employment of aircraft. I take three of these:—

- The speed of transit made available.
- The directness of the route, which can be selected.
- The utilisation of helpful winds, and evading bad weather.

Everyone finds himself confronted with the necessity of knowing, even vaguely, the possible objects of commercial aeronautics when starting to discuss the information desired. This arises from the extremely fine cut qualities of aircraft design, which conduce to specialisation of each machine to specific purpose. In view of this, it is not wise, I think, to say even that the "weight per horse-power" ratio of the complete loaded aeroplane is a direct criterion of the efficiency of a design, however strongly we may recognise its value, and I do admit the essential necessity for a clear summarisation of the "weight per horse-power" ratios of all possible sizes and kinds of aeroplanes, together with the performances and other data.

TABLE B.
FOREIGN AERONAUTICS.

The formation of Industrial Links.	Post Office Reciprocity.	Post-War Inter-Governmental Agreements	Registration of Craft.	Customs and Policing.
Co-ordinating Technical Societies.	(a) Prices for postage.	(Allied and enemy).	(a) Salvage by ships and by aircraft.	Quarantine and Aliens' Question.
	(b) Methods of collection and delivery.	(a) Flying rights.	(b) Exchange of meteorological news.	
	(c) Agreed routes.	(b) Landing rights.		
		(c) Rule of the "road."		
		(d) Supply of aircraft to foreign Governments.		
		(e) International law, prohibited areas, etc.		

* I was fortunately instrumental in bringing to this country the first record of such an aerial way in practical use in Italy, and in securing from Major Perfetti the Italian maps which our recent lecturer, Mr. Holt Thomas, used as a striking illustration of his lecture. Aerial ways from Turin to Milan, to Udine, and from Milan to Rome, down both sides of the coast, form part of the scheme. Recently we learn that the Central Powers are starting a £2,000,000 scheme—Berlin, Constantinople and the East.



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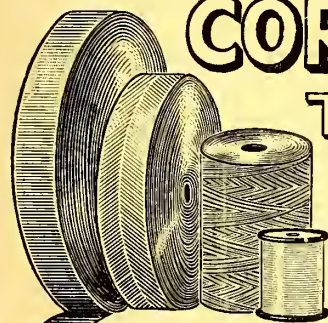
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We need this for the sake of the light they will cast upon the value of a high horse-power per lb. weight. I do not think that commercial aeronautics will, in fact, find that the exaggerated ratio of power to weight, which is so useful for war reasons, will be demanded for peace uses; it is to settle this point among others that the summarising work is needed *now*.

It is, then, a matter for study to determine, (a) What is the amount of gross weight that may be safely entrusted to a given, or available, h.p.?

(b) What is the amount of gross weight that may be safely entrusted to a given wing area, as both will differ according to the class of usage?

The Aeronautical Society and S.B.A.C. Joint Committee is fully warranted in asking for funds and powers to co-ordinate the information on which the thinking process of the designer must be based.

For transit over a district in an aeroplane, which is not exposed to attack from land guns or pursuing aeroplane, there appears to be no urgent need for phenomenal rates of climb in certain, and probably in most, commercial classes of craft. All commercial work will, however, require some rate of climb yet to be determined, which is the minimum which is safe for over-land work on the one hand, and over-sea work on the other. In a country of small spaces like Britain, the distinction will be marked—in wide open lands, the two will approach one another.

To make the idea concrete, 500 feet per minute climb from ground level is a possible safe figure over England, while much less is safe over sea.

Whatever the figure, once this is achieved, any further climbing ability would be got either for some particular reason or would be got only by the accident that the demand for engine power arising from the *speed* desired gave the extra climbing ability.

One of the matters which the Joint Committee is concerned to establish at an early date is, *what is the minimum safe climbing rate* under the two broad classes?

(a) Over Britain (or country of such small alighting areas).

(b) Over sea (or large spaces).

A good deal of this could be collected from pilots *now*, and the Research Bureau to be informed.

DESIGNED PURPOSES.

Next, given that the minimum climbing ratio is secured, we shall find that some of the design will be needed. (a) For high speed expressly. (b) For weight carrying. (c) For long distance work (which does *not* make quite the same demands as weight carrying for short distances, notably because low head resistance is cardinal in C class). (d) For intermediate and special duties.

As soon as rapid climb and quick manœuvring are not demanded differences in design will appear. Class (a) and (c) above will need wing sections like those in war craft, when extremely low head resistance is cardinal. Class (b), which will, no doubt, be wanted for war, will differ in its wing sections from the "minimum head resistance" classes. In all cases, since high controllability and quick manœuvring will be far less essential than in war, it will be much easier to get a reasonable factor of strength, which means that an adequate strength may be got with light weight.

We cannot afford to overlook the importance of using the wind, and thus frequently doubling, say, our speed of transit, and halving our fuel cost. It becomes, therefore, a matter of the greatest moment to know at what height to fly to get the best economy, i.e., for the minimum total fuel expense, for fuel bills will be enormous.

It is to be noted that height enters into the matter in a far more serious way than in relation to the mere extra fuel needed to *climb* to the height for the journey. There is the extra fuel expended in remaining at the selected height, when any such height is desired as requires the machine to fly appreciably *cabré*, i.e., beyond the "maximum point" on the curve of "lift/drag ratio" of the aeroplane measured as a whole.

This indicates another study—the ascertaining of the height of economical travel with the wind (obviously the height of economical travel against the wind is as low as possible consistent with a safe range of glide to alight).

For the purpose of the study it is necessary to have as large a number as possible of lift/drag curves of completed machines as possible in the first place, and in the second place the lift/drag ratio of the entities constituting these machines, so as to get clearly any correction factor which arises from their assembling and mutual interference, and from scale effect.

I am aware that I am putting forward a programme of very great extent, but if the country is to take the air *and keep it*, the sooner these matters are fairly faced the better.

THE COMMERCIAL AND POSTAL USES OF AIRCRAFT.

As we have recently had a suggestive paper on aeroplane transport, giving rough costs on a certain route, I will not dwell on it save to recall the existence of the airship and to touch on one matter which I raised in the discussion, and to what Lord Cowdray also addressed some remarks. I allude to the danger



A Short Section of an Italian Air-Line Map, shown by Mr. Holt Thomas at his recent lecture, and referred to by Col. O'Gorman.

Blackburn

AIRCRAFT

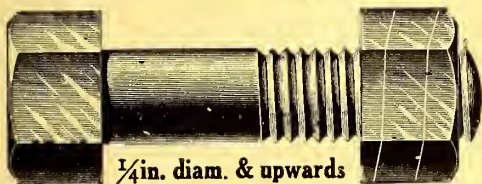
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of the hiatus which might occur between the war demand on our aircraft factories and the peace demand. There appears here all the value that attaches to promptness in giving—"bis dat qui cito dat"—and all the difficulties that attach to foresight.

THE DANGEROUS HIATUS.

In another sphere we know, that to secure the return of soldiers to the land, a Parliamentary Commission has already recommended that immediately on the declaration of peace 20,000 cottages shall be built at or near the land they are to till, thus utilising the building skill now in the ranks and starting the homes for our men on the land.

So far as the housing of workpeople near centres of aircraft production is concerned, this may be said to have been largely provided during the war; what has not been foreseen even on paper with a like definiteness is the absorbing of our aircraft output and the incidentals thereto.

The financing and laying out of the specific postal routes, the location of the mechanics, repair men and tuners at the ports of departure and arrival, the housing of aerodrome officials, group-men, accountancy clerks, the motor-car service from town to aerodrome, the purchase of land and the establishment of title, the preparation of list of flyers who may desire to find occupation at once instead of losing their skill by many months inactivity, the preparation of such drawings as may quickly allow of adapting war aircraft designs to their new uses, and the designing of such new weight-carriers as may be more suitable to transport work; some or all of these things are needed if the industrial organisation of the factories is not to crumble during a long hiatus. Six months of idleness will disrupt any factory organisation, and will lead to the paying off of workpeople and their consequent suffering and discontent. This six months of idleness must not occur.

GETTING READY IN TIME.

Lord Cowdray's outlook, the more value since some kind of Air Ministry seems inevitable, and, indeed, most desirable after the war, was most sympathetic, but he saw and expressed the difficulty. One would like to feel assured that there may soon exist in the desks of private organising companies, brought together *ad hoc* under his aegis, a set of non-clashing plans of campaign on paper, in such detail as to be promptly workable. It is not necessary, but it would be useful if even the names of the intended personnel, most of which is, of course, with the colours, were laid out ready for the call to man the commercial, postal, wireless, directional and automobile and repair services.

We have had one skeleton scheme to awaken the imagination, but we must have many to save the situation. We are confronted with the position that the mere housing of one month's output of the aircraft builders together with the returned war stocks, as soon as the rapid wastage ceases, is a matter of intense difficulty. Thus we are led to formulate the desire that sales of military aircraft to foreign countries, colonies, private users, exploitation companies at home and abroad shall be as prompt as they can possibly be made by every exercise of forethought, subject only to the retention of such devices and machines as are reserved by the military authorities for special reasons.

The policing of the air, though eventually a means of using a number of armed aircraft without appreciable alteration, can only at first consume aircraft on a small scale, however carefully such a scheme be laid out for expansion when the trade develops. It would be putting the cart before the horse to provide for more police than there are potential malefactors, or to provide for enforcing the "rules of the air" on a non-existent traffic.

SAFETY PROVISIONS.

It is paradoxical to say that safety provisions, such as I have outlined, provide some of the most perilous of our subjects for foresight. There is no truer proverb than the French one which calls "*la prudence, la plus triste des vertus*," yet all administrations revel perforce in the gloomy business. They are egged on, in England particularly I think, by the "grandmother in the street," who unsparingly scourges as government negligence any tolerance extended to venturesome enterprise.

The example is to our hand. No car can be sold that cannot break the law, no user exists who does not break it, but the law remains at 20 miles per hour—lest there should be accidents and our parliamentarians would be beaten with scorpions.

We must stand by and pray that a more reasonable scientific and liberal spirit may infuse our safety code and our Board of Trade regulations when they appear.

EDUCATIONAL OF PERSONNEL.

Technical education is, as we all know, one of the main

activities of such an institution of aircraft engineers, as our Society represents, whether we act directly by lectures and degrees or indirectly by premiums and scholarships and by effectively driving home the question of correspondence schools, technical classes, and university studies. The limit of this class of activity is for us the limit of this growing Society's membership and funds.

THE FUTURE PRODUCTION OF AIRCRAFT.

The whole of this lecture is directed to secure this end, and I will pick out only one of the sub-headings in my Table A for special explanation, namely, what I have called "load curve orders."

The bugbear of any production is the uneven distribution in time of the orders received. The intolerable burden of keeping a staff and a system to give a large rate of output for a short time and at short notice should, if possible, be put an end to by foresight. The Government will necessarily have certain orders of its own to distribute, and if it be found that, like the motor-car trade, the industry is fed by a "season demand," then the Government orders might, if possible, be distributed at such dates and in such a way as to even up the load curve of demand.

I do not pretend to detail the good or bad effects if the Army, Navy, Post Office and Transaerien companies and foreign and Colonial Governments all placed all invited tenders on April 2nd and placed the whole of their orders on May 2nd, to the gorging of the lowest tenderers and the ruin of those who made correct estimates, and I do not suggest that there existed no organisation prior to the war for appreciating the factory point of view in the distribution over a period of time of the business of ordering, but I do suggest that any industry with a first-class chance of a steady turnover has also a first-class chance of supplying an article at once profitably and cheaply—two terms which cannot always be justifiably found in juxtaposition.

LABOUR.

The labour question is involved in this same consideration for the same reasons. The process of working "ca'canny" with a view to keeping in his job or making jobs for others is by far the worst economic mistake of the labouring class.

The labourer's desire for his share of wealth is no doubt accompanied by the knowledge that it must be produced to be distributed, but this is overshadowed by the conviction that the firm may fail to get more orders, that a lull may come and that he can extend the period of activity between the lulls and secure jobs for his friends by working dead slow. Abolish the lulls and the thin excuse for slacking vanishes.

I can only put the question, "Is it beyond the wit of man to level up the load curve?" I think not. Strikes and trade disputes are a separate question on which I do not touch.

CUSTOMS.

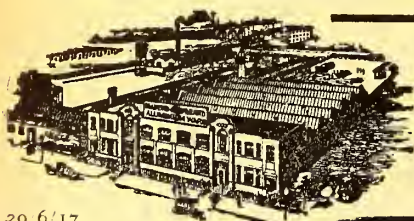
It seems to me that a trading aeroplane can cross a frontier unseen either at great height or by using clouds or at night. It can drop packages at spots pre-arranged with confederates, and can without alighting either return to its own land, or continue upon its through journey and escape being identified by a Custom House officer almost any night of the year.

In November, 1913, a few remarks were made [by Col. O'Gorman] on Customs, and it was pointed out that a Customs inspection of the contents of aircraft on departure on behalf of the country of call was unthinkable, while inspection on arrival, or on dropping goods, involves all countries in having Custom House officials over so large a part of their surface as to suggest that the number of officials would be excessive. Britain is in an exceptional position, its Custom House has some 8,000 officials all over the country (as the Board of Customs has control over all indirect taxation), while the number of dutiable articles is very small. Hence, in the lecture we must base our ideas on the difficulties likely to be raised abroad.

I think it may be decided to be impracticable and conducive to the stifling of aeronautics to make it obligatory on all entering aircraft to concentrate upon some agreed ports of entry. Such a concentration would be highly inconvenient, and the delay of alighting would be contrary to the very first desideratum of an air service speed. It will be time enough later to consider the control required over aliens who might enter with diseases subject to quarantine.

OVERCROWDING AND ANNOYANCE.

Each arrival aerodrome would be liable at times to become a pandemonium of delayed and angry aeronauts. But there are other objections. One would hope to see journeys navigated on



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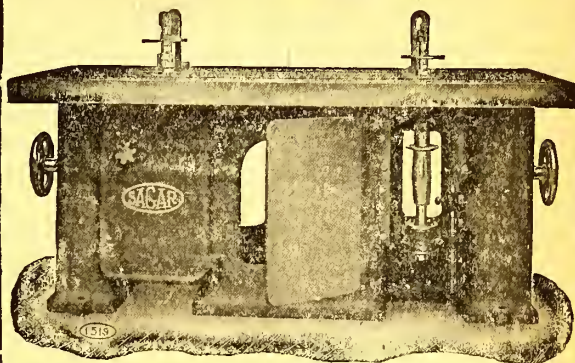
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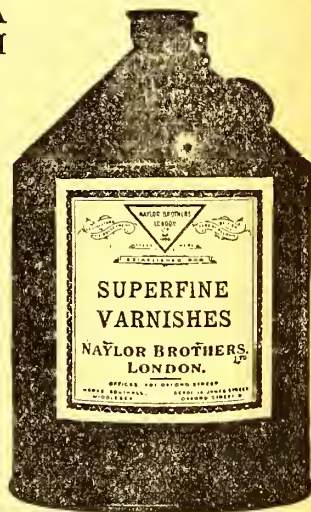
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a course specially selected to utilise the enormous advantage of favouring winds, and minimise the delay and expense imposed by contrary winds, and therefore such journeys would be planned without the hampering influence of arbitrarily imposed places of call. These plans would seemingly be liable to alteration in the air according to the wind encountered, so as to obtain the best economic results.

It will assist in making aeronautics a wealth-producing industry instead of a burden to the State if it is possible to secure that through journeys be made, when desired, without any compulsory stop across one country to another. A significant objection to any alighting for the purpose of Custom House inspection is the probable unfairness of a rule which would be easily evaded by the unscrupulous and which would be very costly to enforce even if the sporting smuggler were no longer with us.

A SIMPLE SOLUTION.

In this tangle of difficulties there is a plan suitable for the first few years which has certainly the merit of simplicity, though probably no other, namely, that all airborne goods should be free of duty; treating whatever advantages thereby accrued to the aerial transport companies as subvention in aid. For such a proposal this at least can be said that the British community would not be unfavourably placed since almost every known commodity is taxed more highly elsewhere.

In the contrary event of a decision to levy duty on airborne goods we must consider the suggestion of a Customs police mounted on fast aircraft to pursue and watch traders.

There are many difficulties about doing this, they are probably even greater than those which are involved in a civil aerial police which we probably must have.

AERIAL POLICE.

For Customs purposes it would be an anachronism to shoot down a suspected smuggler at sight; we cannot board an aeroplane in flight, nor can we know whether he is carrying sufficient hours' fuel to be capable of outdistancing our policeman; moreover, his chance of giving his pursuer the slip by using the shelter of clouds and darkness is quite considerable.

At first, at any rate, it may be best to accept airborne goods untaxed; the class of substances carried will only be those of light weight, or of high value for weight, and of these mostly the ones which derive some advantage from rapid transit. In England we should be chiefly troubled by jewellery, saccharine, tobacco, tea and cocoa, and I doubt if these would amount to a serious difficulty.

We should, of course, be envisaging the issue of an indirect subsidy of an amount not easily knowable, but on the other hand we should economise on what promises to be abnormally heavy costs in collecting the duties imposed. The competition with taxed seaborne or landborne goods would not perhaps be very serious if we remember the greater cost both of transport and insurance in the case of air-borne goods.

FOREIGN AIRCRAFT.

As to the importation of foreign aircraft themselves, this is more easily controlled, because it involves alighting. It has been suggested in paragraph 33 that no preferential landing charges be made against foreign trader aircraft under certain circumstances of reciprocity, and accordingly an interval of stay in a country in excess of some preordained period might constitute importation for taxation purposes or alternately the Gordian knot might be cut, and preferential encouragement given to our own aircraft (as war necessities) on the basis of a bounty to aeroplanes built in the country and so avoid attempting the alternative of a tax on imported foreign aeroplanes.

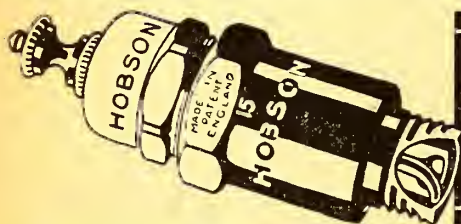
ENEMY AERONAUTICS.

Mr. Horace Darwin, in a previous Wilbur Wright lecture, showed us the value of what he called "inverting" a mechanism with a view to its better understanding, thus often evolving either new results or suggestions for the solution of what previously seemed very difficult. The Gnome engine, with its rotating cylinders, might be called a classic example of "inversion" applied to the petrol engine.

This process of "inversion" can be used, and is illuminating when applied to many war proposals entertained on behalf of one side which judges itself to be approaching to victory over the other. If the Germans had practised this they would have seen the comicality to us of their morning hate movement, already indeed discredited among intelligent Germans, they might have appreciated the recruiting value to us of their early Zeppelin raids, and the pernicious world effect for themselves of frightfulness in Belgium and under the sea, however useful to them for awhile.

INVERSION OF THOUGHT.

It has been suggested as obviously desirable after the war that the Central Powers should be for ever restrained from aerial activity or alternately from any access to Allied landing grounds. Such a proposal should be examined in the light of the inversion process. It was, I think, Mr. J. Swinburne who said that whenever a proposal is described as obvious to the meanest intelligence



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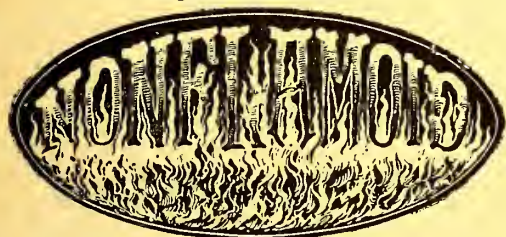
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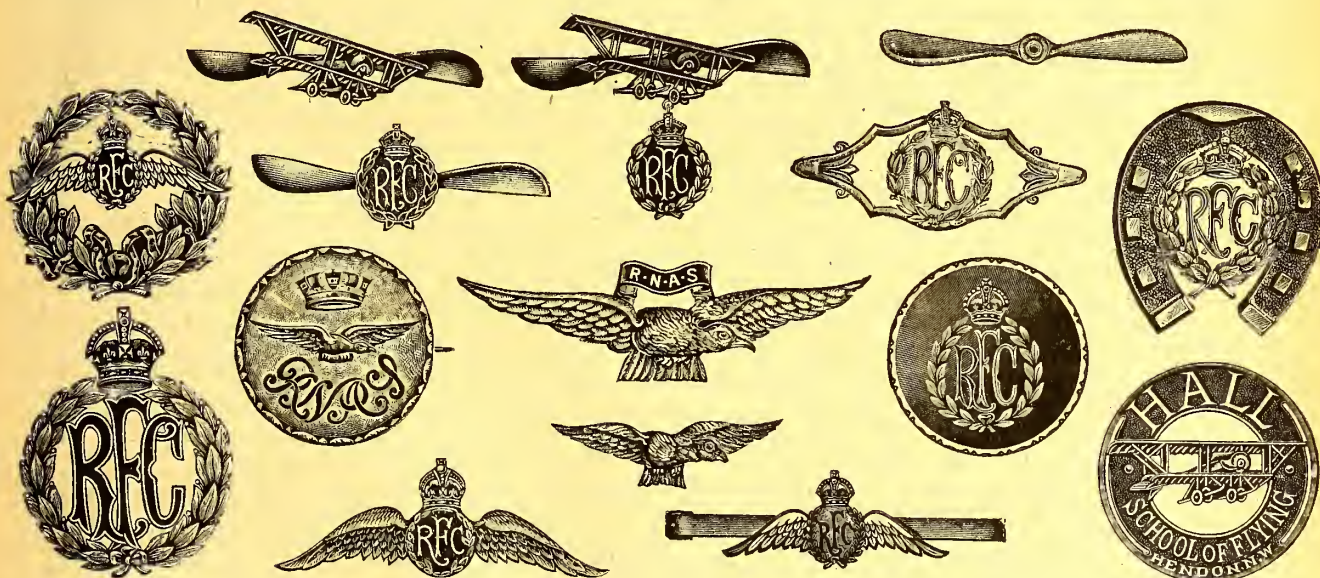
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that is a sign that it calls for careful scrutiny by those of better ability. I am told that the overland aerial route to India, via the territory of the Central Powers, appears to offer special advantages, if I correctly interpret a conversation with Lord Montagu.

At any rate, until matters of this sort are very much clearer than they are now, it would be most unwise to lay down as fundamental desiderata notions which are only founded on our present bellicose attitude towards the enemy, and not on a scientific appreciation of the results evolved. At least we may be sure that the very last thing we want is to ensure for the Germans the exclusive use of the easiest aerial run to India and the East.

COLONIAL AERONAUTICS.

For Imperial and Colonial aeronautics it would be suitable to repeat the same table as was shown for purely British questions, with the introduction of widely different, and, in some cases, very promising aspects due to the greater distances, the absence of postal facilities, the great expense of land transit, the absence of roads, the unexplored and unmapped and unsurveyed regions, and sometimes the peculiarly regular atmospheric conditions. There will be found advantages for rapidly conveying administration officials to points of temporary interest or trouble. The labour question also requires special treatment, and so does the convention for communication between the Colonies and the Motherland.

Here is an immense programme for foreseers and prophets. I believe there was for a moment a slight tendency to prejudice against the formation of an Air Board Committee (Lord Northcliffe's) to inquire into the matters which I have here suggested as a suitable field for foresight, but I now believe that since the first meeting, under Lord Northcliffe, this preliminary doubt has in large measure been dispelled. Whether the Aerial Transport Committee, now sitting, on which this Society is ably represented by its Chairman, General Ruck, C.B., and on which I am sure we are all glad to know that Lord Sydenham has consented to serve, solves all these problems or not, we can feel at least that there exists somewhere a somebody who will make an effort towards the elucidation of some of them.

THE AFTERMATH.

MAJOR DODD, in proposing a vote of thanks to the lecturer, said how pleased he was to find that England is already preparing for the development of aeronautics after the war. Colonel O'Gorman's remarks on smuggling were particularly interesting to America, as his country has some 1,800 miles of border line, and Chinamen quite often smoke opium. So far America has not had cause to consider the utilisation of large aircraft factories after the war, and the whole subject of aviation-after-the-war came as a new problem to him.

DR. MULLINEUX WALMESLEY, of the Northampton Institute, proposed a hearty vote of thanks to Major Dodd for presiding, and one can say with certainty that no vote of thanks to a chairman has ever been carried more sincerely than that to Major Dodd.

Probably no more than two or three of those present knew anything of Major Dodd's fine record as a military aviator in Mexico, or of his long study and practice of aviation before the Mexican War, but his personal charm of manner, his obvious modesty, amounting almost to embarrassment at the position thrust upon him before a somewhat distinguished gathering, and his quiet soldierly bearing quite won the hearts of his audience.

It is to be hoped that in the happy days after the war the Council of the Aeronautical Society may prevail upon Major Dodd to deliver a lecture himself on the experiences which he has yet to acquire in this war, and on his experiences during the past twelve months in the Mexican War.

The present writer had the pleasure of a long conversation with Major Dodd on the subject of flying in Mexico, and can vouch for the fact that in that small campaign alone he has acquired material enough to make a highly interesting and informative lecture. One can safely say that difficult as have been the problems presented to and successfully overcome by the R.F.C. none have surpassed, or have been more cleverly defeated than those tackled by the gallant little band of American military aviators in Mexico, where climate, topography, alleged friendly natives, and enemies together conspired to make the lot of the military aviator a misery.

Major Dodd is a very welcome addition to the rapidly growing group of American aviators and "war Americans" who have done so much for the progress of the world's aeronautics, and who have won such golden opinions in this country. Both on account of the excellence of the lecture and on account of its good fortune in securing such a Chairman, the Wilbur Wright Lecture of 1917 will long remain as an historic event in the Society's affairs.

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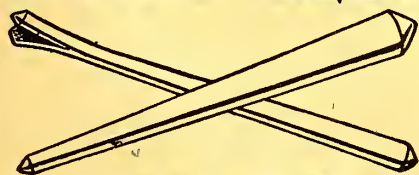
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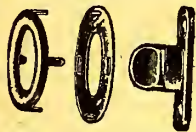
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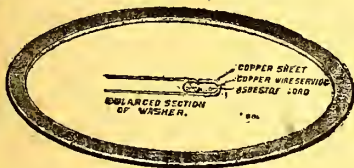
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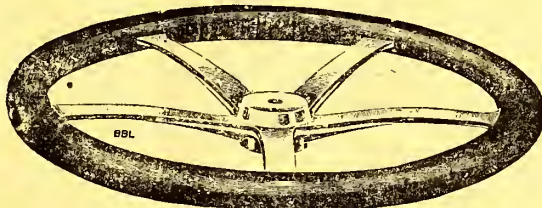
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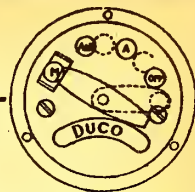
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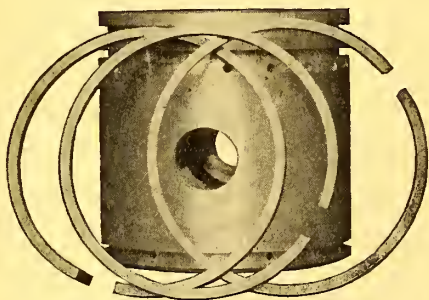
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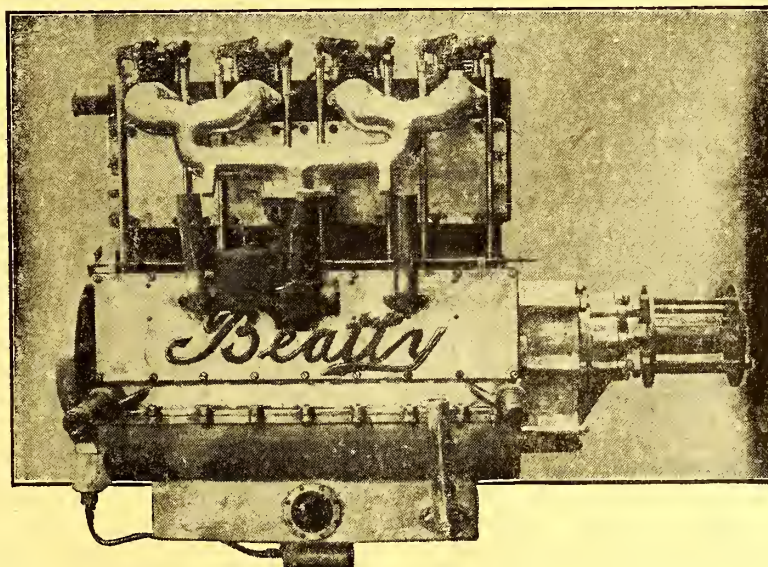


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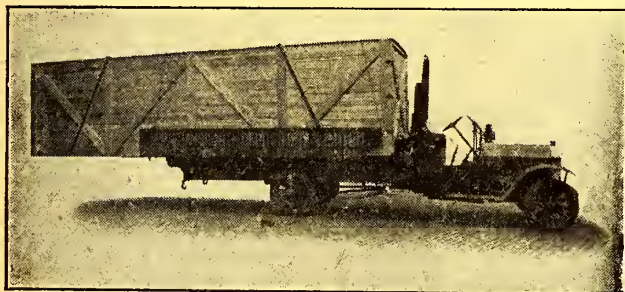


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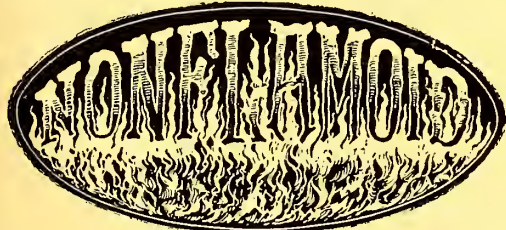
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A LETTER TO THE AIR BOARD.

MY LORD, AND GENTLEMEN,

It is a hackneyed quotation, but none the less true, which says :—"There is a tide in the affairs of men, which, taken at the flood, leads on to fortune." To-day, the tide of events sets in favour of our Flying Services, and it is for you to say whether we put forth on that tide to seize the great opportunity of the war, or whether we again miss the tide.

You have seen the writing on the walls of Folkestone and of the City of London. Take heed that this writing be not "*Mene, Mene, Tekel Upharsin.*"

The Empire has seen its forces slowly consumed in trench warfare, it has seen its best and bravest dying while we have merely scratched at the edge of the enemy's defences, and it has looked in vain for a way out of the seeming deadlock. It has seen the Royal Naval Air Service doing its duty,—much of it duty for which it was never intended,—all over the world, in the deserts of Mesopotamia and Syria, in the wildernesses of East Africa and South-West Africa, over the hills of Gallipoli and Macedonia, and over the plains of Flanders. It has seen the R.N.A.S. tackle the submarine problem with much success. It has seen the Royal Flying Corps, as the eyes of the Army and as an active fighting force, upholding, in spite of its youth and inexperience, the proudest traditions of the British Army, guiding and helping forward step by slow step the painful advance of our trench line.

You, Gentlemen of the Air Board, have likewise deserved well of the Commonwealth. Much co-ordinated effort of warring departments is to your credit. New ideas have been fostered by you. Through your endeavours the output of our aircraft has increased many times over. But, Gentlemen, the full fruition of your labours will only come when the war is won in the air over German ground.

The war has now reached its critical point. On your efforts depends the course of the war from now till its end. The German Army is altogether on the defensive. A defensive army no longer exists if its enemies can strike at the heart of the country which it defends. If that army be passed, below or above, it ceases to exist for the purpose for which it was created.

Germany, hedged in by our citizen army, and by the soldiers of France and Italy, can no longer hope to strike a decisive blow at the Allies in the field. Therefore she strikes at the heart of the Alliance under the sea and in the air.

It is for you, Gentlemen, to counter those attacks by striking at the heart of Germany,—not by spectacular raids on Berlin, or on mere political centres, the face of Germany as it were, but at the very heart of Germany's defences.

Behind Germany's army lie the sources from which it is fed. The iron mines, the steel works, the armament factories, which make her defensive army a reality, lie within reach of the weapons of war which are made under your direction. It is in your power to organise and equip such a force as will cut off Germany's internal munition supplies for her army far more effectually than she, with her submarines, can ever hope to cut off our food supplies.

Already, we hear of a certain shortage of ammunition and of new artillery among the German troops in France, and further shortage means the crumpling of Germany's defences. Destroy the operating machinery of the mines, destroy the blast furnaces, destroy the steel works, destroy the power stations, and you destroy

at the same time the output of shells, guns, locomotives, rails, motor wagons, and everything which enables Germany's army to hold its place. Cut off those supplies and that army must fall to pieces.

Consider also, Gentlemen, the moral effect. Close down the mines and workshops, and you throw hundreds of thousands of people out of work,—a Minister of the Crown told our House of Commons as much about our own workers only a few days ago. Put these people in terror of their lives by continual attacks from the air and you break their nerve. Being idle, they will meet together and talk about their grievances against the Government which threw them into the war and then failed to defend them. And they will set about ending the war by trying to end their Government.

To-day the German people still feel safe behind the sure shield of the unbroken German army. Show them that they also are in the battle-field, and that their army cannot protect them, and they will lose faith in their army, their Hindenburg, and their German God.

By such an offensive alone can we win the war in the quickest possible way. And such an offensive is easy.

It may be objected that we have not enough aeroplanes. I submit that we are nowhere near our limit of output. Every day we are neglecting sources of supply or wasting stocks of material.

It may be objected that we have not enough pilots. I submit that a pilot trained for bombing or fighting only can be produced in a fraction of the time required to train a military aviator.

It is for you, Gentlemen, to organise this offensive. Instead of bowing to popular clamour for reprisals,—mere retaliatory raids in revenge after every enemy attack,—let us take the invasion of Germany by air as a serious problem of the war.

The R.N.A.S., with its big machines in Flanders, has shown conclusively on a small scale what can be done, and the R.F.C. in France has, with greater numbers of smaller machines, also proved the efficacy of bombs.

Surely, Gentlemen, it is better to bomb German towns where munitions are made than to bomb Belgian or French towns in the hopes of destroying munitions made in Germany, or than to cut little railway lines. A filled-in well will cause more soldiers to thirst than will a water-cart hit by a shell, or a cut water-pipe. And a munition factory smashed by a bomb so that it cannot be restored in three months will cause worse shortage, will weaken the German army more, and will be no harder to hit, than a munition dump behind the German lines, which, when destroyed, can be replenished in a few days, or than a railway line which can be repaired in a few hours. Moreover, a destroyed dump means more work and wages in Germany, whereas a destroyed factory means idleness and suffering for the German people.

It is possible not merely to destroy individual factories, but so to lay waste munition-making towns that none dare live or work there. So that this be done effectively, it matters not whether it be done by sailors or soldiers, or by civilians in uniform, by the R.N.A.S., by the R.F.C., or by a composite force of both. It might have been done a year ago, and it is in your power to discover why the attempt failed. The explanation is not difficult. It is for you to see that it does not fail this time.

Delays are dangerous, the temper of the country is also dangerous. The initiative in the new campaign lies with you. The two dimensional soldier has now seen enough of air fighting to remove most of his prejudices against third dimension war. So long as you do not deprive the Army of its eyes, or of its fighting machines which blind the enemy's eyes, you will do no disservice to the Army in the field, and when the enemy feels the shortage of munitions caused by the destruction of his sources of supply, you will have done the greatest possible service to our troops.

In your hands, Gentlemen of the Air Board, lies the decision as to when we carry the war into the enemy's country. When this new war begins you will have with you the whole-hearted support of every soul in the British Empire.

I have the honour to be, Gentlemen,

Your obedient servant,

C. G. GREY.

THE SIXTH YEAR OF "THE AEROPLANE."

With this issue *THE AEROPLANE* completes its twelfth half-yearly volume. Strictly speaking, it is slightly more than six years old, the first issue having appeared on June 8th, 1911, but the volumes have been arranged to run to the exact half-year.

Some idea of the increasing importance of the paper may be gathered from the fact that, including the four extra issues in June, the first volume contained 720 pages in all, including the covers. The low ebb to which aviation sank just before and in the early days of the war is shown by Volume VI (January-June, 1914), which had 732 pages, and Volume VII (July-December, 1914), which shrank to 580 pages.

As the importance of aviation in war began to grow, *THE AEROPLANE* grew with it, and the present issue shows that in the past six months 1,706 pages have been needed. Including the covers, this means over 1,900 pages in all. And even this number of pages has only been enough to contain important matter in a compressed form. I have always been compelled to hold over week by week more matter than has been published, and many subjects which should have been discussed have been forever left untouched.

One never knows what may happen in war-time, so perhaps I may be forgiven for indulging in a few personal notes. In the six years, which include over 300 issues, I have never missed writing the first article in *THE AEROPLANE*. Possibly some readers may regret the fact, but, even so, I take a certain pride in it as a feat of physical endurance, for in the whole six years I have never been able to take a holiday. As a matter of fact, it is over eight years since I have had two consecutive clear days away from work connected with aviation.

It is possible that, under war conditions, a grateful country may provide the otherwise unobtainable holiday. Being a few months under 42 years of age, I am technically liable to military service, but, having been marked on examination by an R.A.M.C. doctor as "unfit for military service," I cannot hope to do any fighting. Nevertheless, under existing conditions, and owing to the curious kind of intelligence possessed by our tribunals, I am fully qualified to become a soldier-servant to either of my two former office-boys who now hold the King's Commission.

In which connection it is interesting to note that of my former assistants on this paper seven are now commissioned officers. When the war broke out I had four very capable male assistants to run a very small paper. Now I have one—equally capable—male assistant to run a very large paper, so it cannot be said that *THE AEROPLANE* office has not been "doing its bit"—to use for once the most idiotic phrase of the war.

The chief satisfaction I feel about the work of the past six years is that, thanks to the ability of my assistants, and to the information conveyed to me by my friends, *THE AEROPLANE* has never been proved wrong on any important service, technical, or political matter, and has on almost all such matters been many months, and sometimes years, in front of public and official opinion. The constantly increasing demand for the paper shows that it is appreciated by those most intimately concerned with aeronautical affairs, and I can only hope that, whatever may become of me personally, *THE AEROPLANE* may continue in years to come to be of as much use to the Services and to the Industry as it has been proved to be in the past.—C. G. G.

ON AN AMERICAN ERROR

About the worst injury one can do to a friend is to tell him that all is well when, in fact, one knows that things are not well; therefore the best turn I can do to my many American friends is to tell the American Press that if it is not mighty careful it is going to make a fool of itself, and of the American nation, and of any of the Allies who happen to believe what some of the papers tell them.

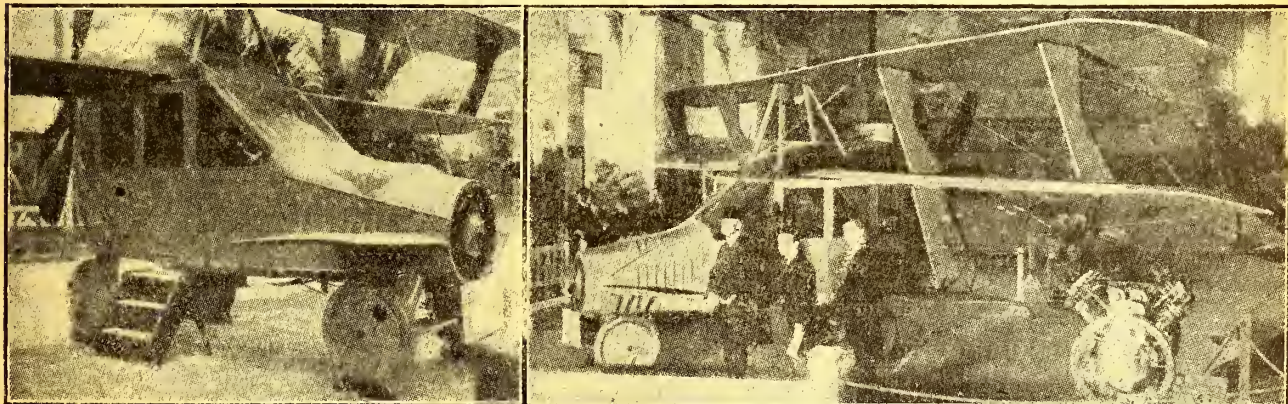
We all expect great things of our new Ally. Some of us know how American troops fought in China, in Cuba, and in the Philippines. Some of us know the skill and daring of American aviators. Therefore we know that America's contribution to the war in men, whether on the ground or in the air, will be of the highest value to the cause of the Allies. But some of us also know American aeroplanes and engines, and we are by no means so sure about the usefulness of American aircraft.

America has probably more automobiles per hundred of population than any country in the world, and I fancy I have seen

most breeds of them, but I cannot recollect ever having seen an American motor car—at least judging by such standards as our Sunbeams or Rolls-Royces or Arrol-Johnstons, or the Italian Fiats or Italas, or Lancias, or the French Peugeots or Renaults or Delaunays, or the German Mercédès or Benzes or Hansas.

I do not forget that the Ford automobile has saved the British nation millions of pounds by doing with a 20-h.p. engine at £130 a time or so, all on, as much work as we in our foolish way should have done with a 60-h.p. £1,500 ambulance or a 40-h.p. £800 motor lorry. Nevertheless, I do not think that even "Henry" himself would claim that the Ford automobile is an efficient motor car when judged by its petrol consumption or by the volumetric capacity of its engine, which is what counts in an aero-engine.

Similarly, America has produced a vast number of flying machines—"airplane" is, I believe, the triumph in cacophony perpetrated to indicate the flying machine by the body which



An Experimental Aerial Limousine Constructed by the Curtiss Aeroplane and Motor Company, and Exhibited at the recent Pan-American Aero Show.

represents officially the American Aircraft Industry—but I cannot recollect having seen either on the ground, in the air, or on paper, anything which one could honestly call an American war aeroplane—judged by the standard of our Sopwiths and Martinsydes and de Havillands, or by the French Spads and Nieuports and Moranes, or by the German Albatroses and L.F.G.s, and Halberstadts, among small machines, and still less as compared with our Handley Pages, the Italian Capronis, the French Caudrons, and the German A.E.G.s. and Gothas among big machines.

I do not forget that the Curtiss airplane has trained hundreds, possibly thousands, of our pilots, nor that pilots like flying it because it obeys its controls instead of controlling the pilot, as some English machines do. But no American aircraft firm has ever built a war aeroplane. It was no insult to the Curtiss when our R.N.A.S. people nicknamed it "the aerial Ford," for in its way it has been as valuable, but it would be no more use on active service than a Ford would be if rigged up as a tank.

Some of my American friends say "Oh! But you can't judge American aeroplanes by the 90-h.p. 'J.N.' Curtiss." My reply is simply that we have had various makes of American machines over here and the Curtiss has been the best of the lot, in design, in material, and in performance. And so far as I can learn from American technical papers and from Americans who have come to England recently, there is not an aeroplane in the U.S.A. which can put up a performance alongside any first-class European war aeroplane.

Certainly the performances claimed by the American makers themselves for their machines at the time of the "Pan-American Aeronautical Exposition," a few months ago, proved conclusively that they were all fully a year behind current European practice. And the photographs of the machines showed clearly that even the eyes of the designers were a year out of date.

A MISTAKEN POLICY.

Therefore, I, for one—and there are many good friends of America who think likewise—regret very much to see the Aero Club of America and the aircraft papers most immediately in touch with it misleading the American lay Press, and so the American people, and thence, via the Press, the ignorant public of Allied nations, into the belief that America is capable of producing at short notice a fleet of tens of thousands of aeroplanes fully able to tackle the enemy's best.

America's technical and lay Press would do better service to the American people if it would impress on its readers the fact that America has still to produce *one* aeroplane, and that it will be time enough to talk about thousands when that one has been proved fit for war service.

FLYING TOO HIGH.

A whole industry cannot be organised in a week or two, so it is sheer nonsense to talk about thousands of American aviators by the autumn, unless the whole American Industry is to be turned onto making school machines, and the half-trained human product is to be sent over to Europe to learn to fly real aeroplanes afterwards.

I was talking to an American friend the other day about the Mexican show, in which the American Army started out with eight aeroplanes, and I asked how long they lasted. He said they managed to make them hold together about eight weeks, which is rather a long time for active service flying, only, of course, they had no enemy aeroplanes or Archies up against them. Then they went back to their base on American territory for some more. "And," said my friend, "in the meantime the American Aircraft Industry had delivered four more aeroplanes."

Now, when the Mexican campaign began, the U.S. Army and Navy between them had some dozens of "airplanes" on order from American firms, and all those firms were months behind with their deliveries, yet the American Press talks gaily of thousands.

QUALITY AND QUANTITY.

The real problem before those concerned with producing America's air fleet is first to get quality and then to get quantity. Both may be acquired simultaneously by good organisation, and neither is any use without the other. The American Press will do better service to its country by hammering in these points than by crying aloud about what is going to be done.

So long ago as April 23rd, that excellent paper "Aerial Age," of New York, announced large on its front cover, "\$120,000,000 for Aeronautics," and "American Aeroplanes are Equal to the Best European Products." If both statements were true the equipment of America's air fleet would be an easy matter. But one cannot agree as to the accuracy of the latter statement, and one doubts the former.

SELF-MADE OFFICIALDOM.

"Aerial Age" apparently bases its claim as to the quality of American machines on the "official report" of "the Advisory Committee on Aeronautics, of which Mr. Alan R. Hawley, the President of the Aero Club of America, is Chairman."

One might be led by this to believe that this is an official committee appointed by the U.S. Flying Services, but one gathers

that it is merely a self-appointed Committee of the Aero Club of America, and that the Aero Club of America, excellent though it be as a Club, does not represent the aggregated wisdom of America's aeronautical technicians. Therefore, its conclusions may easily be misleading.

MISLEADING STATEMENTS.

Certainly, many of the statements made in this so-called "official report" are very misleading indeed. For instance, it says, "The complaints from the representatives of different countries which have ordered aeroplanes in the United States are entirely of our limited output." As a matter of fact, the complaints in England are of bad material, bad workmanship, bad finish, and bad detail design. Kiln-dried wood, cross-grained wood, badly selected wood, wrong kinds of wood, bad steel, bad casting, bad machining, bad assembling, bad glueing, unduly heavy parts in one place, unduly light parts in other places, thin wires where cable should be used, cable where light wires would suffice, thin sheet steel where drop forgings should be used, wood-screws where big bolts and nuts are needed, the worst possible material and work in turnbuckles, and so forth, *ad infinitum*, are among the sins of commission and omission to which one can point.

Further, the "report" says, "They state that they could use thousands of additional aeroplanes of the training type—as well as of the remarkably large seaplanes which are not obtainable elsewhere outside of the United States." This, again, is entirely wrong. Doubtless, Russia, unable to make aeroplanes at all, would be glad of any old thing as a training machine, and though one freely admits that the "Atlantic" Curtiss was the first fairly successful flying boat, Mr. Alan R. Hawley and his Committee will do well to note that it is not a circumstance, either for strength or performance, alongside the modern Porte boats built entirely in England with English engines.

A WILD IDEA.

How much the Committee knows about its job may be gauged from the statement that "all the reports regarding the alleged inefficiency of American aeroplanes and motors are based on the fact that close on two years ago, when it was almost impossible to get the suitable metal for crankshafts, a shipment of American motors proved to be unsatisfactory, and the motors had to be reconstructed in England." As a matter of fact, they had to be reconstructed because of pure hasty workmanship. Bearings were out of line, crankcases had loose bits of metal and filings floating about in them, the lubrication system was all wrong, the propeller attachments were defective, and there were sundry other troubles, but on the whole the crankshafts were rather good.

PURE TOSH.

Further, the Committee says, "Our investigation shows that the statements made recently to the effect that American fighting aeroplanes do not have the speed and climbing ability of foreign fighting machines, is based on the fact that in America we demand a factor of safety of six, whereas foreign machines only have a factor of safety of three."

This is pure tosh. First of all, there has never yet been an American fighting aeroplane. Secondly, there does not appear to be any "demand" for a safety factor of six, or any other figure, in America, for judging by some American types seen here the safety factor is secured mainly by hoping for the best. And anyhow, a factor of safety of six, in theory, is little enough when one investigates the quality of timber used in American aeroplanes.

A factor of three in sound material is a better guarantee of safety than is six in broom-stick timber, and so long as material is not selected with the greatest skill a machine must be unduly heavy in order to be even moderately safe, and so speed and climb must be lost, and so the machine must simply cease to be a fighting aeroplane.

FIGURES RUN MAD.

The report continues, "Likewise, whereas foreign countries accept machines that land at a speed of close to 100 miles an hour, in the United States we expect our fast aeroplanes to land at a speed not exceeding 60 miles an hour."

One just gasps at such astounding ignorance of contemporary aviation. Where Mr. Alan R. Hawley and his precious committee acquired their ideas one cannot even guess. Personally, I cannot recall even one of our very fastest machines which cannot land at less than 50 miles an hour, and many can be landed at under 40. Most of them, in fact, will fly with the engine throttled down at well below 50 miles an hour and remain under perfect control, and consequently can land at a far lower speed.

My friend Mr. Grover C. Loening can vouch for the fact that he has flown at over 130 and under 40 on the same British machine in the course of the same flight, and that was a big fighting machine, not a little light single-seater.

This egregious report further says, "Considering that we have a factor of safety twice as large as the foreign machines and that we have a landing speed not exceeding 60 miles an hour, our fighting machines compare favourably with the foreign machines

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in speed. We get a speed of approximately 130 miles from our machines while the European machines, with the lower factor of safety and greater landing speed, get only about ten miles more."

Bunkum! my dear Mr. Hawley. Pure unadulterated bunkum. Even supposing your arguments as to factors of safety and landing speeds were correct, instead of being absolutely false as they are, your committee would only have proved that your machines are theoretically better than ours, and theoretical efficiency is not worth a damn in war, as your unhappy aviators will discover if the U.S. Army and Navy pays the slightest attention to your committee's report.

What the aviator wants and what he must have are climb and speed and controllability. Always climb and speed and controllability. Otherwise he becomes a sitting shot for the first Hun chaser who appears. And certainly it would puzzle you to find any American aeroplane which had ever done 130 miles an hour when reliably timed by trustworthy time-keepers, at any rate up to the date when your report was issued.

WHAT AMERICA MUST HAVE.

What you have got to have in a fighting machine, if it is to be any good by next winter, is a speed of 140 miles an hour at 10,000 ft. (not just above the ground). It must land at not more than 50 miles an hour, because of the small fields in France. It must be able to reach 15,000 ft. in not more than 15 minutes. It must have its "roof" not below 22,000 ft. It must be able to dive vertically for an unlimited time without going so fast as to fall to pieces when it is pulled out of the dive with moderate care and intelligence. It will need something like 250 h.p., and it must carry fuel for five hours. If you cannot produce that, you had better give up trying to build fighting aeroplanes.

What you have got to have in a bombing machine is a speed of 100 to 110 miles an hour at 10,000 ft., when loaded with fuel for six or seven hours, full crew, and at least a ton of bombs (any less weight is mere playing at bombing). It need not have any particular rate of climb, but it must be able to get up to 15,000 to 20,000 ft. after shedding its bombs, so as to get home safely in daylight. It must be inherently stable, and it must carry enough machine-guns to defend itself against attack by hostile aeroplanes. And it must have not less than 600 h.p.

When the American Aircraft Industry has produced two aeroplanes which come up to those specifications—they represent roughly something a shade better than the Germans have got in service in hundreds to-day—then the U.S. Army can standardise on them.

It would be sheer imbecility to standardise on anything worse, because in three months' time they would be absolutely out of date, and it would be just as sensible to send pilots out on the old J.N. type Curtisses.

AN ENGINE YARN.

So far America has not produced the real aero-engine. Numerous firms have produced quite good engines, which have made aeroplanes fly, but one cannot hear of anything which has stood up to active service conditions as the German Mercedes and Benz and various French and British-made engines do.

The latest yarn from America, reported in the "Morning Post" on June 19th, says that "Mr. Haward Coffin, one of

the leading automobile engineers of the country, and a member of the Council of National Defence," has invented an engine which "will be the basis of the great aerial fleet which the United States will construct." According to this story, "Mr. Coffin secured from the British, French, and Italian War Offices plans of the engines of their fighting machines, and with the aid of his engineers has created (*sic*) an engine which they believe will meet the most exacting demands. The Bureau of Standards is now engaged in standardising the machinery and patterns which will be used in turning out the engines in quantities. The largest automobile factories in the country will be given contracts for building these engines, and so heavily will their facilities be taxed that the output of pleasure cars will be materially curtailed."

Now, having some considerable respect for the common sense of the U.S. Army, I do not believe the yarn, for it seems impossible that the Authorities would standardise thus on an engine which cannot have been tried on active service, or even for a sufficient period under artificial active service conditions. When one recalls the lamentable results of premature standardising in the States of the Hispano-Suiza, and other engines of proved excellence, one cannot imagine that an untried engine, however excellent in theory or on the bench-test, would be standardised to such an extent.

But the mere fact that the yarn is being put about so energetically in the American and British Press, suggests that there is something behind it. And, anyhow, it is likely to give all sorts of false impressions and to raise false hopes in both countries. It is not in the least likely to intimidate the Germans, but it is likely to cause bitter disappointment and discontent in Allied countries.

It will be time enough for the American Press to begin shouting when America has produced one really sound, reliable engine which is as good as the best European engine.

WHEN TO SHOUT.

I do not for a moment doubt the ability of the American Aircraft Industry to make good, given time, and supposing that it is content to learn from European experience and improve on European ideas. But it is a grievous error to let the American people think that American genius is just going to scratch its head for a few minutes and forthwith produce something epoch-making in the way of aeroplanes which has only to fly about over these effete European Armies and stop the war.

The chief fault of the American people is that they are so damnably English. They always think they know better and are better than anybody else, and they always buy their experience to the contrary in the most expensive way, just as we do. Look at the history of the Civil War, the Cuban war, the Philippine war, and the Mexican war, and you will find mistake after mistake made in the best English manner, and put right after vast expense, rather more quickly than the English would have done it, but not much more cheaply.

If America is not careful she will go standardising on some quaint aeroplane or engine just as we standardised on those fatal B.E.2s and R.E.8s, and R.A.F. engines, and with equally disastrous results. If America is wise she will learn from our experience and "go slow." And if the American Aircraft Industry is wise it will tell its aeronautical Press to keep its mouth shut until the Industry has produced something about which it is worth while to shout.—C. G. G.

THE OPINION OF EXPERIENCE.

Mr. Holt Thomas, in an interview on June 22nd, said he was greatly impressed by the American proposal to construct a fleet of 10,000 aeroplanes. "Yes, I think it is quite practicable," he said, "and America will make a success of it. We have gained wonderful experience in the matter of construction and speed as a result of the war. To-day the construction of aeroplanes is very different from that of but a few months ago. We are, no doubt, as a result of our experience, miles ahead of the States in the matter of aeroplanes. Machines with a speed of 80 miles an hour are absolutely no use now, being obsolete. If America, building upon expert advice which we can give and will supply her with, constructs 10,000 machines, she will have done much to win the war. The country with the most aeroplanes is going to win this war."

THE RETORT COMPLETE.

In "The Imperialist" dated June 20th, Mr. Pemberton-Billing deals in quite the most effective manner with a scurrilous paragraph which appeared in the "Daily Chronicle." Mr. Billing's friends who have been exasperated by the "Chronicle's" persistence in hitting below the belt may rest assured that Mr. Billing is quite able to protect himself against those who inspire the "Chronicle's" attacks.

Here is Mr. Billing's method of dealing in his paper, "The Imperialist," with the latest effort:

"My attention has been called in particular to a leading article which appeared in the 'Daily Chronicle' last Tuesday, in answer

to one of their readers, whose letter—remonstrating with them on their attitude towards me—they published with the following comment:—

"In answer to our correspondent's challenge, we should like to say that Mr. Billing has not proved to the public that his opinions on aviation are of any practical value. It is only since he convinced members of the House of Commons that he is more of a wind-bag than an expert that they declined to listen to him. The best national service that Mr. Billing can tender is to show that he is capable of doing something, instead of merely talking. He is of military age; he has no influence whatever in the House of Commons or anywhere else. Our Air Services have been reorganised on lines different from those which Mr. Billing had in view, and an efficient organisation now exists. Mr. Billing should place himself at the disposal of some national service and remove the suspicion which now rests upon him that he is a slacker."

"As an example of the methods and style of the Party Press I do not think too much publicity can be given to this sort of diatribe, and as I believe the publicity afforded by the columns of the 'Daily Chronicle' is not what it was, I reprint the passage here, and would merely suggest to my readers who hold strong opinions on Air matters, and who may have been in the habit of buying the 'Chronicle,' that they should contrast its attitude in this matter with that of the 'Daily Express,' and act accordingly. The people can control the Press—which they support—as they can control the politicians whom they elect, if they care to exercise their power."



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SUNDRY REVIEWS.

BY "BERKELEY."

There is a tradition of great age which implies that officers of the British Army have no love for the acquisition of knowledge bearing on the art of war. The legendary soldier, expert in polo, racing, shooting, and the more vivid sports of the land, was never held to be guilty of skill in the technical branches of the profession to which he belongs. Nat Gould and "Ruff's Guide to the Turf" were, it was said, more prominent features of a soldier's private library than were the works of Clausewitz or Bonnal. Leave, occasionally interspersed with a few brief hours of unwelcome work, and that implying no mental strain, was the customary routine of the soldier's year.

This is the view embodied by the undeveloped imagination of the British Public, a body constitutionally devoid of all interest in the Army, save when a warlike enemy threatens disturbance of the comforts of the British home. But based as it is on false premises, there is little truth in the tradition. While never rivaling the consistent localised pertinacity of a Methodist draper, nor competing as a bibliophile with a British Museum librarian, the British officer has never as a class been uneducated, and of recent years the last generation has attained to a high standard of military scholarship. That no professional soldier talks freely of his mental equipment is not surprising. Such talk would only be comparable with fireside chats on "How I Won the V.C." or "When I Saved the Adjutant in Action."

THE BENEFITS OF STUDY.

The military skill of such officers as Sir Douglas Haig, Sir Hubert Gough, or the Earl of Cavan, is not solely instinctive, but is based on a past intelligent study of the principles of warfare as laid down by the great authorities of the past and of the present. In knowledge, if not in powers of expression, they are worthy successors of Guibert, Clausewitz, Hamley, Maurice, and Henderson (the late Colonel Henderson), no less than in practical warfare they follow in the successful steps of Alexander, Eugène, Marlborough, Napoleon, and Von Moltke.

In the Royal Flying Corps there must be many officers who desire to make the military life their profession, as well as a means of existence. They will attain success only by consistent hard work in the theory and practice of military science. Study of military principles is as much an essential part of the road to greatness as is years of practice in the intricacies of aerial acrobatics.

To assist in a small way such officers, the Editor has decreed that from time to time notes on recently published books, great and small, dealing with military subjects, shall appear in these columns. And this shall constitute my apology to those who are not interested in such matters. Democracy may have overthrown crowned autocrats, but no successful attack has yet been made on editors. Their will is still paramount.

INSTRUCTION ON THE LEWIS AUTOMATIC MACHINE GUN.

By "Simplex." (Forster, Groom & Co., Ltd. Pp. xii+143. 2s. net.)

In estimating the practical surprises of the war in its initial stages the machine-gun will find an important place. The rapid advance of the Germans in August, 1914, was due mainly to three things in which they were infinitely superior to their opponents—their well-organised mobility, their supply of big guns, and their supply of machine-guns (and *en parenthèse* of trained machine-gunners).

Though for many years enlightened opinion in the British Army had asked for an increased issue of

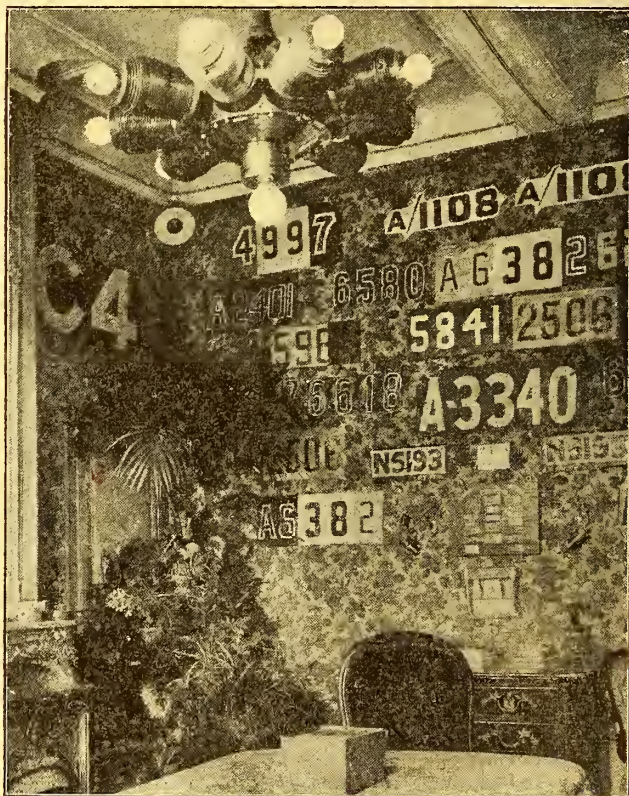
machine-guns to each battalion, nothing had been done, owing to the political desire for economy on matters that did not affect votes. Thus the war began with a British Army equipped in a manner which would have been proper in the dark ages of the war in South Africa, taking the field against a German Army in which each battalion of infantry had sixteen machine-guns. Meagre though this issue would seem in the light of present practice, it was ample enough to give the German a great tactical advantage.

We possessed a few Maxim guns in those days, but we had no Lewis guns at all, though the virtues of the Lewis were obvious. It cannot supplant the Maxim gun, but it has uses peculiar to itself which are of high value in a modern army. In aerial warfare under present conditions it stands almost without a rival. Its light weight and the simplicity of its magazine feed are both of first importance in aerial work.

The book under review contains a clearly written description of the gun itself, illustrated both by photographs and line drawings. The modern custom of supplementing by well-printed photographs a line drawing, which to the untutored eye may represent an iron-work gate, the plan of a railway junction, or a gun, with equal conviction, has much in its favour. The detail which is incomprehensible in the drawing is often clear in the photograph and *vice versa*.

After an explanation of the mechanism of the gun, a brief chapter is allotted to drill and the manner of its execution.

The second part of the book, from page 61 onwards, is devoted to all that concerns the handling of the gun in action. "Methods of Fire," "Indirect Fire," "Characteristics of the Machine Gun," are headings of chapters.



BEHIND THE LINES.—Captain Baron von Richthofen's sitting-room at the Headquarters of his "Circus." Possibly some of the numbers from the machines of his victims may be of interest to flying officers. The Gnôme electrolier is a quaint conceit.

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CERTAIN APHORISMS.

In the chapter dealing with the uses of the machine-gun in trench warfare there are many aphorisms which will appeal to those who have made trench warfare a chapter in their own lives.

"The advantage of changing the position is that, if the past machine-gun officer has not been wise in his control of fire, the enemy have very likely marked down the position and will in due time shell it heavily." Herein lies the secret of the infantryman's coldness to the adjacent machine-gunner!

"Do not fire the machine-guns unless: 1. There is a very good target with which rifle-fire cannot properly deal. 2. The enemy attack your trench in large numbers, so that you are really needed. 3. Your own men are attacking." Compliance with these three rules can do much to restore brotherly love in the trenches between the happily mobile machine-gun detachments and the somewhat stationary infantry. The latter often suffer because of the former's enthusiasm in the practise of war!

A good chapter is devoted to "Range Taking" and its problems. The book is in general excellent, and contains much information which is of value to the aerial gunner, though there is no special attempt to deal with his difficulties.

PRACTICAL NOTES FOR MACHINE-GUN DRILL AND TRAINING. By Captain Seymour Rouse. (Forster, Groom & Co., Ltd. Pp. 82. 6d. net.)

The title-page of this book bears a sentence which adequately explains its scope: "To be read in conjunction with official handbooks." It does not profess to supersede the official booklets on machine-gunnery, but simply to elucidate points which are compressed and hidden in official language not always clear to the young soldier. No attempt is made to describe in detail any type of machine-gun, nor is exhaustive treatment given to any part of the subject. Elementary training receives the most attention.

The genesis of the Maxim-gun is explained in an extract from a letter written by the late Sir Hiram Maxim to the author. There is nothing new in the story, save that he speaks of first thinking of designing a machine-gun operated by the recoil when in the Southern States shortly after the Civil War. A generation passed before his dream was realised.

An optimistic note on the last page of the pamphlet deals with the conversion of a German machine-gun to suit British .303 ammunition.

The pamphlet would appear to be written primarily for the use of instructors in machine-gunnery, and possesses value for this purpose, especially in view of its extremely low price.

A BOOK.

Mr. William Heinemann has published a book entitled "The Way of the Air," written by Mr. Edgar C. Middleton, who further describes himself as "An Air Pilot," late Flight Sub-Lieut., R.N., and author of "Aircraft."

Reference to the Royal Aero Club's list of certificates does not disclose the fact that Mr. Edgar C. Middleton has ever qualified for an aeroplane or airship pilot's certificate, and it seems unlikely that perusal of his book will suggest that any mistake has been made by the Aero Club in omitting his name from the list of such pilots.

In his introduction Mr. Edgar C. Middleton states that a certain trophy was carried off by a certain R.F.C. officer "by a flight from Montrose to Farnborough, via Portsmouth, a distance, in direct line, of 445 miles." Reference to the map does not disclose how such a course could be in a direct line.

Mr. Edgar C. Middleton further states that it was the R.A.C. that arranged the "Daily Mail" competitions. Reference to the annals of the Royal Automobile Club does not indicate that that estimable caravanserai ever arranged aviation competitions.

Mr. Edgar C. Middleton further states that "The 'Daily Mail' international cross-country flight for £1,000 was won by Louis

ONE-MAN RANGE-FINDERS AND HOW TO USE THEM. By "Simplex." (Forster, Groom & Co., Ltd. Pp. 31. 6d. net.)

The constant complaint of people who read military books for the first time, as with the youthful student of logic, is that all the statements contained therein are "so obvious." This criticism, however, applies to all the non-mathematical sciences in an equal degree, but it is in truth quite fallacious. The alphabet is delightfully obvious, but it has to be learnt, nevertheless.

The apparent simplicity of a subject is its greatest danger. The learning of anything which is inherently difficult is the simplest in the end, as the effort for mastery impresses the details on the memory. Subjects of apparent ease are harder to retain.

Range-finding has all the difficulties of ease. Macaulay's schoolboy would understand the principles of a range-finder of any of the accepted types, such as the Barr and Stroud or the Marindin, in a very few minutes, but the ranges found by him during the first attempts after instruction would possess more of amusement than accuracy.

This pamphlet by "Simplex," who, like Homer, according to modern theory, would seem at times to be many, so versatile are his subjects, describes such one-man range-finders as are likely to be used by the average infantryman and machine-gunner, and details with the aid of many sketches the method of operation. It gives concisely all that it is necessary to know in these matters. It is a necessary adjunct to the books noted above.

ARTILLERY LINES OF FIRE WITH MAP AND COMPASS. By Arthur L. Hunt, Lieut., R.F.A. (T.F.). (Forster, Groom & Co., Ltd. Pp. 40. 1s. net.)

This pamphlet deals briefly with such matters as the magnetic variation of a compass and the method of its accurate discovery, the locating of position on a map by the use of a prismatic compass and a protractor, the obtaining of a line of fire to a visible target with a prismatic compass without the use of a map, and on an accurate method of reproducing a portion of a map to the same or an enlarged scale. All of which elementary points should be thoroughly understood by the aviator, especially those who are engaged on observation for artillery.

It is well printed, but the price seems high for thirty pages of large type.

[Any or all of these books may be obtained from the Wm. Dawson Publishing Co., Ltd., 2, Breems Buildings, E.C.4., at the price mentioned, price about 2d. each for postage.—Ed.]

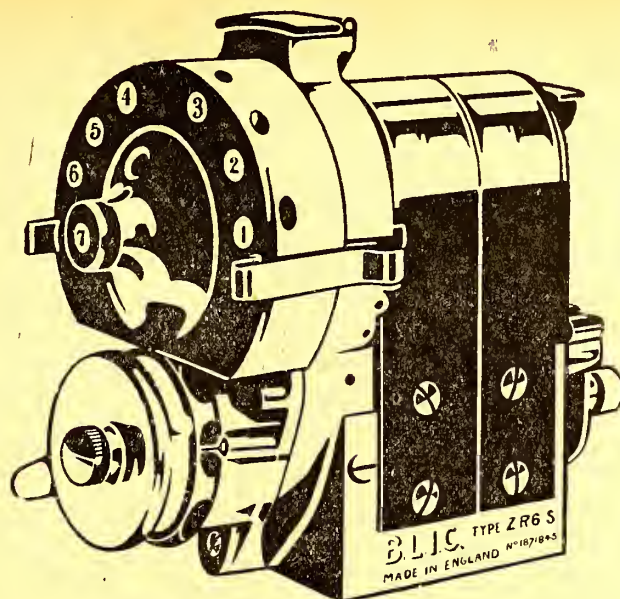
Blériot, July 25th, 1909." Reference to the chronicles of the Royal Aero Club discloses the fact that M. Louis Blériot won a "Daily Mail" £1,000 prize for flying across the Channel, and does not disclose any £1,000 prize offered by the "Daily Mail" for an international cross-country flight.

Mr. Edgar C. Middleton further states: "It is needless to remark that this flight has now become an every-day occurrence." Reference to history does not disclose that any other person has ever flown across the Channel with a 28-h.p. engine.

Mr. Edgar C. Middleton further states that "the £10,000 London to Manchester flight was awarded to Louis Paulhan (France)." Reference to the history of the period discloses the fact that the London to Manchester flight was accomplished by Louis Paulhan, and one cannot quite comprehend how a flight can be awarded to anybody.

As all these curious errors occur in the first eight pages of the book, it did not seem worth while to wade through the remaining 176.

The slip cover of the book is embellished with a silhouette picture from a Martinsyde advertisement which has appeared on various occasions in THE AEROPLANE. It seems to be about the most accurate thing in the work.



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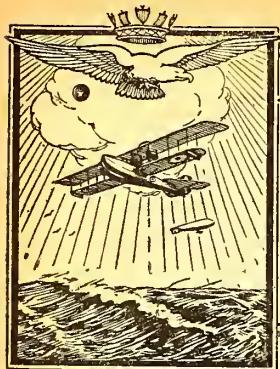
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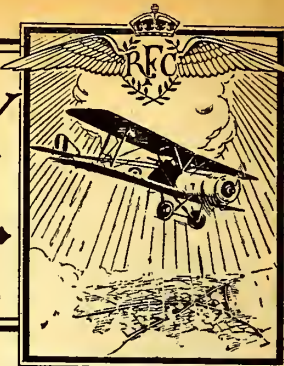
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FROM THE "LONDON GAZETTE."

WAR OFFICE, June 19th.

REGULAR FORCES.—ESTABLISHMENTS.—R.F.C.—MIL. WING.—
—Flt. Comdrs.—From Flying Officers, and to be temp. Capts.
whilst so empld.:—Sec. Lt. N. B. Hair, Spec. Res., May 31st.
Temp. Lt. H. L. Satchell, attd. R. War. R., and to be transfd.
to Gen. List; Temp. Sec. Lt. A. C. Randall, Gen. List; Sec.
Lt. L. M. Mansbridge, Dorset R., June 3rd. Temp. Sec. Lt.
H. P. Rushforth, Gen. List, June 4th.

WAR OFFICE, June 20th.

REGULAR FORCES.—The undermentioned man to be temp.
Sec. Lt. for service in the field.

CORPS OF ROYAL ENGINEERS.—Sec. Cl. Air Mech. Herbert
Charles Gray, from R.F.C., May 12th, 1917.

ESTABLISHMENTS.—R.F.C.—MIL. WING.—Staff Officers, 1st Cl.
—(Graded for pay as a G.S.O., 1st Grade, at the War Office).—
Lt. (temp. Maj.) B. S. Foster, Hamps. R., T.F., from a Special
Appt. (graded as a Park Comdr.), and to be temp. Lt.-Col.
whilst so empld., May 17th. 3rd Cl.—(Graded for pay as a
G.S.O., 3rd Grade, at the War Office). Lt. (temp. Capt.)
J. H. Simpson, Spec. Res., from a Flt. Comdr., and to retain his
temp. rank whilst so empld., May 17th.

SCHOOLS OF INSTRUCTION.—SCHOOLS OF MILITARY AERONAUTICS.
—Asst. Instrs.—(Graded as Equipment Officers, 2nd Cl.).—May
26th, 1917: Lt. A. H. L. Beale, Spec. Res., an Equipment
Officer, 3rd Cl.; Sec. Lt. F. T. McElwee, an Equipment Officer,
3rd Cl., and to be temp. Lt. whilst so empld.

MEMORANDUM.—Actg. Sgt.-Maj. O. T. Stone, from R.F.C.,
to be Sec. Lt. for duty with the R.F.C., June 6th.

TERRITORIAL FORCES.—R.E.—Lt., to be Capt., with pre-
cedence as from June 1st, 1916.—Sec. Lt. (temp. Capt., R.F.C.)
C. D. Danby, M.C., and to remain secd.

WAR OFFICE, June 21st.

REGULAR FORCES.—MEMORANDA.—Sgts., from R.F.C., to
be temp. Sec. Lts. for duty with the Mil. Wing of that Corps:—
J. G. O'Giollagain, May 29th. R. F. Round, June 8th.

SPECIAL RESERVE OF OFFICERS.—SUPPLEMENTARY TO REGULAR
CORPS.—R.F.C.—MIL. WING.—Lt. (temp. Capt.) H. Tomlinson,
M.C., to be Capt. (April 1st, in his original order of seny.).

* * *

ADMIRALTY, June 22nd.

The King has been graciously pleased to give orders for the
following appointments to the Distinguished Service Order:—

Flt. Lieut. Christopher John Galpin, R.N.A.S.

Flt. Lieut. Herbert George Brackley, D.S.C., R.N.A.S.

In recognition of his services on the morning of April 14th,
1917, when he carried out a raid on Bruges Harbour with
good results in spite of difficult conditions. Great credit is
due to him for his persistence and determination. He also
dropped bombs on Ostend seaplane base on the night of
May 3rd-4th, 1917, making two trips.

The King has been graciously pleased to approve of the award
of the Distinguished Service Cross to the following officers:—

Flt. Comdr. Philip Leslie Hoimes, R.N.A.S.

Flt. Sub-Lieut. (now Actg. Flt. Comdr.) Herbert Gardner Travers,
R.N.A.S.

In recognition of his services with the Army in France. This
officer has himself brought down three hostile aeroplanes com-
pletely out of control, and has taken part in two other combats
in which enemy machines were forced to land in our lines.
He has always shown the greatest determination in leading his
flight on offensive patrols, and has on many occasions driven
down superior numbers of hostile machines.

Flt. Lieut. Edward J. Cooper, R.N.A.S.

Flt. Sub-Lieut. Charles Reginald Morrish, R.N.A.S.

Flt. Sub-Lieut. Henry George Boswell, R.N.A.S.

Flt. Lieut. Charles Langston Scott, R.N.A.S.

Flt. Lieut. Walter Travers Swire Williams, R.N.A.S.

Flt. Lieut. Thomas Grey Culling, R.N.A.S.

In recognition of his services on April 23rd, 1917, when the
two other machines he engaged a formation of nine hostile
scouts and two-seater machines. Two two-seater machines
were shot down, one of them by Flt. Lieut. Culling unassisted.

Flt. Lieut. Francis Dominic Casey, R.N.A.S.

For conspicuous bravery and skill in attacking hostile aircraft
on numerous occasions. On April 21st, 1917, he attacked a
hostile two-seater machine at a range varying from 40 to 100
yards, and brought it down completely out of control. On
April 23rd, 1917, on four different occasions during one flight,
he attacked hostile machines, one of which was driven down
in a spinning nose-dive, and another turning over on its side
went down properly out of control. This officer has driven
down four machines completely out of control, and forced many
others down.

Flt. Lieut. Charles Adrian Maitland-Heriot, R.N.A.S.

Flt. Sub-Lieut. John Roland Secretan Devlin, R.N.A.S.

Sub-Lieut. Rupert Forbes-Bentley, R.N.V.R.

In recognition of their services in a bombing attack on the
Kuleli Burgas Bridge on Jan. 4th, 1917, when several direct
hits were scored and considerable damage done. The machines
were exposed to anti-aircraft, rifle and machine-gun fire during
the attack, and also on the return journey.

Flt. Sub-Lieut. Leo Philip Paine, R.N.A.S.

Flt. Sub-Lieut. Robert Leckie, R.N.A.S.

Flt. Sub-Lieut. Basil Deacon Hobbs, R.N.A.S.

Flt. Sub-Lieut. Charles McNicoll, R.N.A.S.

Lt. Sub-Lieut. Valentine Edgar Sieveking, R.N.A.S.

In recognition of his services on the night of May 3rd-4th,
1917, when he dropped bombs on Ostend seaplane base with
good results, making two trips.

Flt. Sub-Lieut. Harold Thomas Mellings, R.N.A.S.

In recognition of his services on March 19th, 1917, when he
attacked hostile aeroplanes with great gallantry at heights vary-
ing from 12,000 to 2,000 ft.

Flt. Sub-Lieut. Frederick Earle Fraser, R.N.A.S.

Flt. Lieut. (Actg. Flt. Comdr.) Charles Dawson Booker.

For special gallantry in the field on numerous occasions,
especially the following:—

On April 26th, 1917, he went to the assistance of some of our
photographic machines, which were about to be attacked by
12 Albatros scouts. One of these he fired on at close range,
and brought it down out of control. On May 24th, 1917,
whilst on patrol, he went to the assistance of a formation of
our machines, which was being attacked by nine hostile scouts.
He attacked one of the latter, which was driven down in
flames and crashed. Later in the same day he attacked and
drove down out of control another hostile machine. On
numerous other occasions he has attacked enemy machines,
and driven them down out of control.

Flt. Lieut. George Goodman Simpson.

For gallantry and able leadership in aerial fighting, notably
on the following occasions:—

On May 3rd, 1917, he drove down a hostile aeroplane out of
control. On May 11th, 1917, while on offensive patrol with
five other machines, he attacked six hostile aircraft. One of
these he brought down out of control, and a few minutes later
he attacked another at close range and brought it down in
flames. On May 23rd, 1917, he led a formation of five machines
to attack at least twice that number of hostile aeroplanes. Both
formations became split up, and a general fight ensued. Five
times during the combat he drove off hostile aeroplanes from
another of our machines, and one of those which he attacked
was seen to go down in a spin.

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The following officers have been awarded a bar to the Distinguished Service Cross for subsequent acts of gallantry:—

Flt. Comdr. Theodore Douglas Hallam, D.S.C., R.N.A.S. (D.S.C. announced in "Gazette" of December 15th, 1915.)

Flt. Comdr. Roderic Stanley Dallas, D.S.C., R.N.A.S.

In recognition of his services on April 23rd, 1917, when with two other machines he engaged a formation of nine hostile scouts and two-seater machines. Two two-seater machines were shot down, one of them by Flt. Comdr. Dallas unassisted. (D.S.C. announced in "Gazette" of Sept. 6th, 1916.)

Flt. Lieut. Charles Langston Scott, D.S.C., R.N.A.S.

Flt. Lieut. Robert Alexander Little, D.S.C., R.N.A.S.

For exceptional daring and skill on many occasions, of which the following are examples:—

On April 28th, 1917, he destroyed an Aviatik; on April 29th he shot down a hostile scout, which crashed. On April 30th, with three other machines, he went up after hostile machines and saw a big fight going on between fighter escorts and hostile aircraft. Flt. Lieut. Little attacked one at 50 yards range, and brought it down out of control. A few minutes later he attacked a red scout with a larger machine than the rest. This machine was handled with great skill, but by clever manoeuvring Flt. Lieut. Little got into a good position and shot it down out of control. (D.S.C. announced in "Gazette" of Feb. 16th, 1917.)

* * *

The following awards to R.N.A.S. ratings have also been approved:—

DISTINGUISHED SERVICE MEDAL.

Actg. Air Mech., 1st Cl., F. Bate, O.N., F.13351.
Air Mech., 2nd Cl., A. G. Flowers, O.N., F.19901.
P.O. Mech., 3rd Cl., J. W. Rose, O.N. J.2348 (Dev.).
Air Mech., 1st Cl., G. B. Clements, O.N. F.9008.
Air Mech., 2nd Cl., J. R. Laycock, O.N. F.9281.
C.P.O., 3rd Cl., V. F. Whatling, O.N. 238581 (Ch.).
Air Mech., 1st Cl., D. G. Rennett, O.N. F.9088.
Air Mech., 2nd Cl., C. S. Laycock, O.N. F.10364.

* * *

The following awards to R.N.A.S. ratings for miscellaneous services have also been approved:—

DISTINGUISHED SERVICE MEDAL.

E.R.A., 2nd Cl., A. M. Langley, O.N. 270895 (Po.).
Air Mech., 2nd Cl., W. P. Caston, O.N. F.4177.
Air Mech., 1st Cl., A. E. Shorter, O.N. F.7380.

* * *

The following officers and men have been mentioned in dispatches:—

Sqdn. Comdr. Joseph Ruscombe Wadham Smyth-Pigott, D.S.O., R.N.
Flt. Comdr. Theodore Douglas Hallam, D.S.C., R.N.A.S.
Flt. Sub-Lieut. John Roderick Ross, R.N.A.S.
Mid. Edward Rupert Snow, R.N. (since killed).
Air Mech., 1st Cl., Walter Thomas Hollidge, O.N. F.8633 (since died of injuries).

WAR OFFICE, June 22nd.

REGULAR FORCES—ESTABLISHMENTS.—R.F.C.—MIL. WING.
Staff Officer, 3rd Cl. (graded for pay as a G.S.O., 3rd Grade, at the War Office).—Capt. S. O. Everitt, Res. of Officers, from an Adj., May 17th.

REGULAR FORCES.—M.G.C.—The following ceases to belong to the Mach. G. Corps on joining the R.F.C.:—Temp. Capt. M. G. Millar.

WAR OFFICE, June 23rd.

REGULAR FORCES.—STAFF.—The following appointment is made:—

ATTACHED TO HD.-QR. UNITS.—Brig.-Comdr.—Lt.-Col. Comdt. J. G., Duke of Atholl, C.B., M.V.O., D.S.O., from Yeo., T.F., and to be temp. Brig.-Gen. while so empld., vice Col. E. D. J. O'Brien, C.B., June 12th.

TERRITORIAL FORCE.—R.H. AND R.F.A.—Capt. (temp. Maj., R.F.C.) F. W. Smith, with precedence as from June 1st, 1916, and to remain secd., June 12th, 1916.

WAR OFFICE, June 25th.

REGULAR FORCES.—STAFF.—The following temp. appt. is made at the War Office:—Staff Lt.—Capt. L. M. Wells-Bladen, R.F.C., Spec. Res., from a Flying Officer, vice Lt. (temp. Capt.) P. G. Edge, Lond. R., T.F., June 5th.

ESTABLISHMENTS.—MIL. WING.—Flt. Comdr.—Secd. Lt. (temp. Capt.) B. E. Sutton, M.C., Yeo., T.F., from a Flying Officer, May 6th, 1917.

MEMORANDUM.—The undermentioned to be temp. Sec. Lt. (on prob.) for duty with R.F.C.:—Sec. Cl. Air Mech. Leopold Ernest Stratford George, Baron Garvagh, from R.F.C., to be temp. Sec. Lt. (on prob.) for duty with the Mil. Wing of that Corps, June 6th, 1917.

FROM THE COURT CIRCULAR.

BUCKINGHAM PALACE, June 20th.

The following officer had the honour of being received by His Majesty, when the King invested him with the Insignia of the Order into which he has been admitted.

THE DISTINGUISHED SERVICE ORDER.

Lieut.-Col. the Hon. John Boyle, R.F.C.

His Majesty then conferred decorations as follows:—

BAR TO THE MILITARY CROSS.

Lieut. Charles Cleaver, R.F.C.

THE MILITARY CROSS.

Lieut. Harold Pearson, R.F.A. and R.F.C.

NAVAL.

The following appointments have been made in the R.N.A.S.:
JUNE 20th.—Temp commissions as Lt. (R.N.V.R.) have been granted to J. R. Gibb and F. J. R. Macfadyen, seny. respectively June 19th and July 1st, and both apptd. to "President," addl., for R.N.A.S.

JUNE 22nd.—Temp. commission as Lt. (R.N.V.R.) has been granted to W. H. Fentiman-Coates, seny. June 21st.

THE CASUALTY LIST.

Reported June 20th.

MISSING.—Parker, Flt. Sub-Lt. L. H., R.N.

ACCIDENTALLY INJURED.—Garland, Prob. Flt. Officer A. H., R.N.
PREVIOUSLY REPORTED MISSING, NOW KILLED.—Bennett, Flt. Sub-Lt. S. L., R.N.

Reported June 23rd.

KILLED.—Rogers, Prob. Obs. Officer T., R.N.

ACCIDENTALLY KILLED.—Bibby, Flt. Sub-Lt. J. R., R.N.

MISSING, BELIEVED KILLED.—Potvin, Flt. Sub-Lt. J. E., R.N.

MISSING, BELIEVED PRISONER.—Paine, Flt. Sub-Lt. L. P., R.N.

PREVIOUSLY MISSING, NOW PRESUMED ACCIDENTALLY KILLED.—

Avery, Flt. Sub-Lt. G. G., R.N.

PREVIOUSLY MISSING, NOW OFFICIALLY PRISONER OF WAR.—Mur-
tion, Flt. Sub-Lt. H. S., R.N.

Reported June 25th.

ACCIDENTALLY KILLED.—Crowe, Flt. Sub-Lt. H. L., R.N.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER.—
Daniell, Flt. Sub-Lt. J. E., R.N.

ROYAL NAVAL DIVISION.—PREVIOUSLY REPORTED MISSING,
NOW OFFICIALLY PRESUMED TO HAVE BEEN KILLED.—Whiteside,
Sub-Lt. R. C., R.N.V.R., attd. R.F.C.

MISSING.—Elliott, W. E., Air Mech., 1st Gde., F.12589.

PERSONAL NOTICES.

DEATHS.

BENNETT.—Flt. Sub-Lt. Samuel L. Bennett, R.N., only son of Mr. and Mrs. Bennett, of Tipton Hall, Tipton, St. John's Devon, has been officially reported killed in the air battle on April 29th. He was educated at Clifton, and had only just finished his course at Pembroke College, Cambridge, when war was declared. Joining the R.N. Armoured Car Section, he served for one year in France as interpreter and dispatch rider. Later he transferred to the R.N.A.S., in which he has done much valuable work.

CROWE.—An inquest was held at Plymouth on June 20th on the body of Flight Sub-Lieut. Harold Lawrence Crowe, R.N. On Friday, June 22nd, he was returning from a patrol, and when approaching the beach his machine was seen suddenly to nose-dive from a height of 1,500 ft. In falling it turned a somersault and landed on the water on its back. The place was located, and the body and machine were recovered by sweeping the following day. The jury returned a verdict that death was due to shock, the result of injuries accidentally received.

ENGAGEMENTS.

CROSSLEY MEATES—SEARS.—An engagement is announced between Flt. Lt. B. Crossley Meates, R.N., elder son of Mr. and Mrs. H. Meates, Oatland Court, Cheltenham, and Florence Lilian, only daughter of the late J. G. Sears and Mrs. Sears, Collingtree Grange, Northamptonshire.

HAVERS—DANIELS.—The engagement is announced of Flt. Lt. John W. Havers, R.N., eldest son of the late William Joseph Havers (barrister-at-law) and Mrs. Havers, of Thelton, Arundel, Sussex, and Winifred Rosabel Daniels, elder daughter of Joseph John Daniels, of Wykeham, Sydenham.

BIRTH.

WILSON.—On June 18th, at Elm Lodge, Rochester, the wife of Flt. Comdr. W. Hayland Wilson, R.N.A.S., of a son.

It was reported from The Hague on June 11th that a gold medal and certificate have been awarded to the interned British aviator, Lieut. Charles Morrell, for gallantry in rescuing a man who fell into the North Sea from Scheveningen Pier on May 6th.

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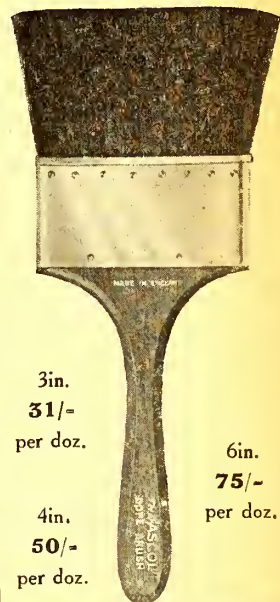
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The following letter describes Lt. Morrell's gallant act:—

"We were walking on the pier with Rita and Mrs. Hageman, and were attracted to the side by a sudden rush of people, whose attention was attracted by some object in the sea. I then lost Morrell in the crowds, but when I got to the edge of the pier, I saw a man in the water obviously drowning, and after about a minute's interval somebody jumped in to save him quite a distance away from me. The sea was particularly rough, and he had great difficulty in holding the man, but he finally managed to drag him ashore amidst the cheers of thousands of people.

"I then heard somebody at my side say that it was an English Interned Officer that had jumped into the water to save him, so I immediately rushed down onto the sands and pushed my way through the crowds, and thus saw Morrell, practically exhausted, surrounded by soldiers. I took charge of him and half led and half carried him onto the front, and with the help of some friends put him in a carriage, but as there was no coachman near, I decided to drive the cab myself, and forthwith drove him to the Hageman's house—the coachman caught us up on the way. We then gave him a bath, and he soon recovered.

"Naturally, he is now the hero of the day, and will assuredly get both an English and a Dutch life-saving medal, which he thoroughly deserves, as the height of the pier cannot be less than 40 feet, and with all clothes on, except boots, and a strong current against you, and a high sea, combined to make it a most excellent performance, as well as doing no end of good to the reputation of the English Officers. The papers have been full of it, and the house is inundated with telegrams and letters of congratulations."

MILITARY.

G.H.Q. COMMUNIQUE'S.

JUNE 20th, 8.45 p.m.—The weather was less favourable for flying yesterday, but work in conjunction with our artillery was continued with good results.

One German aeroplane was brought down in air fighting, and one other hostile machine was shot down by our anti-aircraft guns.

Two of our aeroplanes failed to return.

JUNE 20th, 9.30 p.m.—Valuable work was performed by our aeroplanes yesterday in spite of unsettled weather.

Bombs were dropped on an enemy dump, causing an explosion, and six German machines were brought down in air fighting.

Three of our machines failed to return.

JUNE 22nd, 8.50 p.m.—Work in conjunction with our artillery was continued by our aeroplanes yesterday in spite of bad weather, and good results were obtained.

In air fighting one German aeroplane was brought down and six others were driven down out of control.

Three of our machines are missing.

JUNE 24th, 8.40 p.m.—In air fighting yesterday, two German aeroplanes were brought down and one was driven down out of control. Another hostile machine was shot down in our lines by our anti-aircraft guns.

One of our aeroplanes is missing.

JUNE 25th, 8.52 p.m.—There was heavy fighting in the air yesterday.

Five German aeroplanes were brought down by our machines, and five others were driven down out of control.

Another hostile machine was shot down by our anti-aircraft guns.

Five of our aeroplanes are missing.

* * *

WAR OFFICE COMMUNIQUE.

The G.O.C. the British Forces in Macedonia reports:—

JUNE 19th.—Our aircraft have bombed Porna and Tumba stations (east of Seres), Savjak (five miles south of Demirhissar) and St. Vrac (13 miles north-north-east of Petritch).

THE CASUALTY LIST.

Reported June 20th.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Jessop, Lt. A. J., R.F.C.

WOUNDED.—Couve, Sec. Lt. N., R.F.C.

Hogg, Sec. Lt. A. W., Yeo. and R.F.C.

Holland, Sec. Lt. V. J., R.F.A. and R.F.C.

Loutit, Sec. Lt. J. A., Camb. R. and R.F.C.

Pring, Sec. Lt. N. G., R.F.A., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED MISSING, BELIEVED KILLED.—Adams, Sec. Lt. V. H., R.F.C.

Pinson, Sec. Lt. I. L., S. Staff. R., attd. R.F.C.

MISSING.—Thayre, Capt. F. J. H., M.C., R.F.C.

INDIAN FORCES.—MISSING.—Cubbon, Capt. F. R., M.C., Inf., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Stedman, Sec. Lt. F., Res. of Officers, attd. R.F.C.

CANADIAN CONTINGENT.—WOUNDED.—Bailey, Capt. W. I., Inf., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED MISSING, BELIEVED KILLED.—Allen, Capt. A. S., M.C., West Ont. R., attd. R.F.C.

Reported June 21st.

KILLED.—Birkin, Sec. Lt. T. R. C., Drag. Gds., attd. R.F.C.
Keevil, Capt. C. H. C., W. Yorks. R., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—Oakes, Sec. Lt. R. C., R.F.A., attd. R.F.C.

WOUNDED.—McMaking, Sec. Lt. O. L., Yeo. and R.F.C.

Stacey, Sec. Lt. D. W., R.F.C.

Wyatt, Sec. Lt. W. J., R.F.C.

MISSING.—Anderson, Sec. Lt. R. W. L., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS IN GERMAN HANDS.—Bevington, Lt. R. J., R.F.A., attd. R.F.C.

Binnie, Lt. A., R. Sco. Fus., attd. R.F.C.

Birks, Lt. N. A., R.F.C.

French, Lt. G. S., Camb. R. and R.F.C.

Frew, Sec. Lt. J. G. H., R.F.C.

Hamilton, Sec. Lt. H. D., R.F.C.

Harding, Lt. G. P., M.C., Ches. R., attd. R.F.C.

Hume, Lt. S. S., Yeo. and R.F.C.

Law, Sec. Lt. E. R., R.F.C.

Lloyd, Sec. Lt. E. A., Yeo. and R.F.C.

Wilson, Sec. Lt. F. H., R.F.C.

Winkler, Sec. Lt. W. O. B., R.G.A. and R.F.C.

Reported June 22nd.

KILLED.—Protheroe, Lt. W. B., R.F.C.

Turnbull, Sec. Lt. W., R.F.C.

Vessey, Sec. Lt. J. A., R.F.C.

Watt, Sec. Lt. R. S., R.F.C.

WOUNDED.—Harper, Sec. Lt. J., R.F.C.

Jacobs, Sec. Lt. E. S., R.E., attd. R.F.C.

CORRECTIONS.—Okeden, Lieut. H. G. P., R.F.C. (reported wounded), should read:—Parry-Okeden, Lieut. H. D., Aust. F.C.

Clarke, Sec. Lt. H. Y. C., R.F.C. (reported wounded and missing), should read:—Clarke, Sec. Lieut. H. Y. Chatfield, S. Wales Bord., attd. R.F.C.

Davis, Sec. Lieut. H., E. Yorks. R., attd. R.F.C. (reported prisoner in German hands), should read:—Davies, Sec. Lieut. H. D., R.F.C.

Reported June 23rd.

KILLED.—Grant, Sec. Lt. R., R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—

Dobson, Sec. Lt. A. E. J., R.F.C.

WOUNDED.—Allsop, Sec. Lt. G., Sher. For. and R.F.C.

Carruthers, Sec. Lt. A., R.F.C.

Dines, Sec. Lt. R. I., Lond. R. and R.F.C.

PREVIOUSLY REPORTED WOUNDED, NOW REPORTED KILLED.—R.F.C.—Hickling, 77687 2nd Cl. Air Mech. R. (North Malvern).

Reported June 24th.

KILLED.—Craig Sec. Lt. H. W., R.E., attd. R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED.—

Davies, Sec. Lt. G. A. H., Mon. R. and R.F.C.

WOUNDED.—Adamson, Sec. Lt. C. L., R.F.C.

Denovan, Sec. Lt. A. MacN., R.F.C.

Knaggs, Sec. Lt. K. J., War. R., attd. R.F.C.

Kington, Sec. Lt. S. B., D. of Well. R., attd. R.F.C.

Richmond, Sec. Lt. C. S., R.F.C.

MISSING.—Rogerson, Lt. H., L. N. Lanc. R. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER IN GERMAN HANDS.—Maxted, Lt. O. D., Buffs (E. Kent Regt.) and R.F.C.

CANADIAN CONTINGENT.—KILLED.—Lockhart, Lt. W. E., Engrs., attd. R.F.C.

WOUNDED.—Flanagan, Lt. T. F., E. Ont. R., attd. R.F.C.

MacDonald, Capt. K. G., Field Art., attd. R.F.C.

Reported June 25th.

KILLED.—CAVALRY SPECIAL RES., attd. R.F.C.—Bradley, 907 L.-Cpl. R. J. (Dunavally.)

HOME FORCES.—MISSING.—R.F.C.—Dempsey, 21203 Sgt. J. (Edinburgh); Sibley, 77252 2nd Cl. Air Mech. R. (Ealing, W.)

Reported June 26th.

MISSING.—De Conway, Sec. Lt. J., Yeo. and R.F.C.

Fowell, Sec. Lt. C. H., Oxon. and Bucks. L.I. and R.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONERS OF WAR IN GERMAN HANDS.—Burbury, Lt. A., M.C., Yorks., attd. R.F.C.

PERSONAL NOTICES.

DEATHS.

ALLEN.—Capt. Arthur Spencer Allen, M.C., Western Ontario Regt., attd. R.F.C. (previously reported missing, now reported missing, believed killed), was awarded the Military Cross last September "for conspicuous gallantry on several occasions, notably when he organised and led parties against an enemy post, dispersing them with bombs. He also volunteered and cut a gap in the enemy's wire previous to a raid."

BIRKIN.—Lieut. Thomas Richard Chetwynd Birkin, Dragoon Guards and R.F.C., killed on June 12th, aged 22, was the eldest son of Mr. and the Hon. Mrs. Stanley Birkin, of Park House, Mapperley, Nottingham. He was gazetted to a second lieutenancy in the Yeomanry in 1914, being attached to a squadron which was commanded by his uncle, Major H. L. Birkin. On the declaration of war, after training, he proceeded with his regiment to the Gallipoli Peninsula, and was present at the action which took place after the landing at Suvla Bay. Later the regiment was ordered to another front, and in July, 1916, Mr. Birkin obtained a permanent commission in a Dragoon Guards regiment. Returning to England, he was attached to the Reserve Cavalry Depot for a few weeks, and then applied for service in the Royal Flying Corps, to which he was temporarily transferred. He passed all his examinations, obtained his wings in nine weeks, and at the beginning of December, 1916, went abroad with a flying squadron. He came home on sick leave at the end of January, but returned to the front three weeks ago. His commanding officer writes:—"Your son had not been with us very long, but was a good pilot and promised to do very well." Mr. Birkin was the eldest grandson of Sir Thomas Birkin, Bart., and a nephew of Viscount Chetwynd. His next brother, Sec. Lieut. H. R. S. Birkin, is also serving abroad in the Flying Corps.

BOND.—At an inquest on June 20th on Lieut. H. S. H. Bond, R.F.C., whose machine collapsed during a sham fight at Hounslow, Capt. Hoskinson said that half an hour earlier he (the witness) broke the height record by reaching 16,000 ft. in the same machine.

[Presumably the "record" for the type of machine used.—Ed.]

BOTTOMLEY.—Sec. Lt. Edwin Rhodes Bottomley, Royal Field Artillery and R.F.C., who was killed in action on June 2nd, was the second son of the late Benjamin Bottomley and of Mrs. Bottomley, of Bradford and Ben Rhydding, Yorks, aged 22.

CLARK.—Capt. Walter Llewellyn Clark, R.F.C., who was killed in action on May 23rd, was the only son of the late Walter and Mrs. Clark, of Douglas, The Grove, C.E., Finchley. He was educated at Northgate, Winchester, and was a silver medalist of the Royal Academy. He joined the Artists' Rifles at the outbreak of the war, and in Dec., 1914, was gazetted to a battalion of the Middlesex Regt. He was transferred to the Royal Flying Corps, and obtained his pilot's certificate in Feb., 1916, being promoted to captain in Nov., 1916. His squadron commander writes:—"I wish I could tell you how I appreciated him, and how great a personal loss he is to us all."

CUMMING.—Sec. Lt. A. Lionel Cumming, R.F.C., killed in action on June 7th, was a grandson of the late Colonel R. O. Cumming, 52nd Regiment, of Coulter, Cheltenham, and fourth son of Mr. J. H. Cumming, whose death, the result of an accident, occurred in Valparaiso on the same day as that of his son at the front.

DAVIS.—Lieut. Albert Davis, R.F.C., was killed at Yatesbury, Wilts, on June 20th.

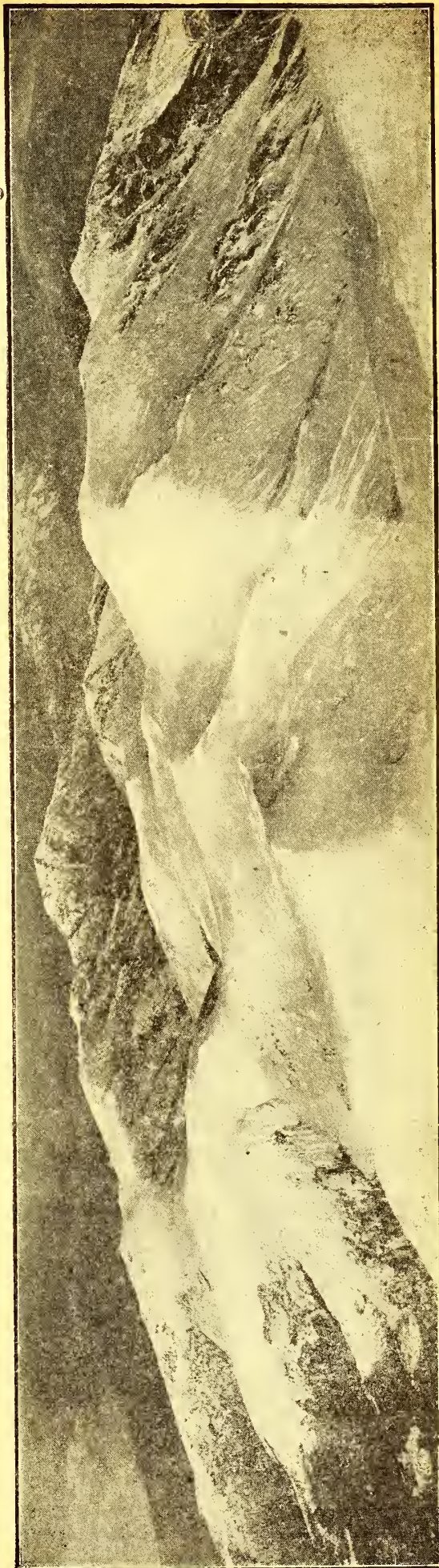
DEVENISH.—Lt. George Weston Devenish, R.F.A. and R.F.C., who was killed on June 6th, was the elder son of Mr. and Mrs. Weston Devenish, and was born at Hillfield, Mitcham, on July 25th, 1893. He entered Charterhouse in September, 1907, and represented his school at Bisley in the shooting eight in 1910 and 1911. From there he passed into Woolwich in January, 1912, and passed out into the Royal Field Artillery in July, 1913. He went to the front in August, 1914, and was wounded in October of the same year. He returned to active service on June 1st, 1915, and had been serving continuously ever since. In May, 1916, he was temporarily attached to the R.F.C., and took his pilot's certificate in October of that year.

DREY.—Lt. Adolphe Drey, M.C., A.S.C., attached R.F.C., who died in Egypt on May 9th, as the result of a flying accident, was the second son of the late Emile Drey, of Roubaix, France, and nephew of Oscar Drey, of Withington, Manchester, and was in his 23rd year. He was educated at Ladybarn House School, Withington, Gresham's School, Holt, and at University College, Reading, where he obtained his diploma in agriculture. Joining the A.S.C. in 1915, he saw service first in France and then in Gallipoli, where he stayed till the evacuation. He was then sent to Egypt and promoted Lieutenant. In June, 1916, he was awarded the Military Cross for his services in Gallipoli. He had only recently been transferred to the Royal Flying Corps, and was engaged in a course of instruction when he was killed. His commanding officer writes that he was "a gallant and promising pupil."

GARNETT.—Lieut. William Patrick Garnett, Royal Berks Regt., attached R.F.C., who was previously reported missing, and is now unofficially reported killed on March 30th, was the husband of Mary Whiddon Garnett, of Church House, Clifton, and eldest son of William and Jane Russell Garnett, of Backmill Hill House, West Town, near Bristol. He was 22 years old.

GREVELINK.—Lieut. E. J. Y. Grevelink, Duke of Wellington's Regt. and R.F.C., was killed in action on June 6th.

HERD.—A verdict of accidental death was returned on June 19th at an inquest on the body of Lieut. Rupert Holton Herd, R.F.C., who was killed in an aeroplane accident on the South Coast. It was stated that the petrol tank burst and that flames shot 100 ft. into the air. The pilot of the machine—Mr. Herd



A Balkan Landing Ground. Mount Kaimakalan, on the Serbian Front, Photographed by a Freepack Aviator.

was observer—was stated to have had 20 hours' experience of flying, which was considered sufficient to justify him in making a long journey.

GOLDIE.—Cadet Barré D. F. Goldie, R.F.C., aged 18 years, died on June 23rd at a Military isolation hospital. He was the son of Lancelot and Gertrude Goldie, of Derby.

HALL.—Sec. Lt. Charles Sidney Hall, R.F.C., who was killed in an air fight at the front on April 7th, was the son of Mr. J. J. Hall, of Westfield, Ashington, Northumberland, and was educated at the North-Eastern County School, Barnard Castle, and Armstrong College, University of Durham, where he was preparing for the profession of a mining engineer. He was a member of the O.T.C. both at school and at the university, and held an honorary instructor's certificate and the medallion of the Royal Life Saving Society. His eldest brother, Capt. L. W. Hall, R.F.C. and Border Regt., is an R.F.C. fighting instructor, and his other brother is serving with the R.E. at the front. He was 18 years old.

HEADLEY.—Sec. Lt. Herbert Marshall (Roy) Headley, R.F.A., attached R.F.C., officially reported killed on March 11th, was the only son of Mr. and Mrs. E. M. Headley, of Uplands, Redhill, and the only grandchild of Mr. and Mrs. F. W. Herbert, of Brookfields Moss, Herefordshire. At the beginning of the war, when only 17 years of age, he enlisted in a Lancers regiment, but in May, 1915, he obtained a commission in the Field Artillery, and went to the front in January, 1916. On May 24th following he volunteered for trench mortar work, and remained in a trench mortar battery until last December, when he obtained a transfer to the R.F.C. In the engagement in which he took part on March 11th, at a height of 8,000 ft., his machine was hit, and he was apparently wounded, but continued to fire his gun as the machine descended into the enemy's lines. His grave has since been found on reconquered territory.

JACOT.—On June 23rd, Lt. Jacot, R.F.C., was killed while flying near Birmingham. The machine is said to have turned turtle when nearing the ground. Lt. Villiers, R.F.C., was badly injured. It is supposed that a gust of wind caused the accident.

KITSON.—Sec. Lieut. H. S. Kitson, R.F.C., formerly of Victoria, Australia, was accidentally killed on June 15th.

LUCAS.—Lt. Thomas Farquhar Lucas, Royal Warwickshire Regt. and R.F.C., who was killed in action on June 16th, was the elder son of Sir Edward Lucas, Bart., of 72, North Gate, Regent's Park. His age was 30.

MARGETSON.—Sec. Lt. E. A. Margetson, R.F.C., of Eve Road, Tottenham. He had been sent to a flying school in Surrey, and was being taken up for the first time, when the engine stopped, and the machine dived to earth, both pilot and pupil being killed.

MILLAR.—Sec. Lt. Scott Millar, R.F.C., died on June 22nd in the Lincoln Military Hospital in consequence of a heart attack while flying at an aerodrome in the vicinity. He had complained to a comrade of pains at the heart.

When flying at a height of 1,500 or 1,700 ft. his machine was observed to stall, turn over, and nose-dive to the ground. The pilot died on the way to the hospital. It was stated at the inquest that he probably fainted while flying.

NEWTON.—Lieut. Murray Edell Newton, R.F.C., killed on June 18th, was the only son of the Rev. G. Herbert Newton, vicar of Bromley Parish Church, E., and formerly for many years vicar of St. Matthew's, Willesden, and Mrs. Newton. He was educated at Roundwood College, Harlesden, and St. John's School, Leatherhead, and afterwards at the Central Technical College for Engineering, South Kensington.

At the outbreak of the war he enlisted in the Artists' Rifles, and obtained his commission in the London Regiment. After a course of machine-gun instruction he was appointed instructor to the regiment, and afterwards to his brigade. Joining the R.F.C. in the summer of 1915, he obtained his "wings," and became an efficient pilot.

His Flight Commander writes:—"He and his observer had done excellent and gallant work throughout a very trying time, and I had already recommended him for promotion, which he would undoubtedly soon have obtained. Your son was engaged with others of our machines fighting some of the enemy, when both he and his observer were shot, and the machine fell to earth. Their bodies have been buried near where they came down, as it was just where the opposing lines are."

FROTHEROE.—Lt. W. B. Protheroe, R.F.C., killed, was the son of Mr. W. H. Protheroe, Park Crescent, Llanelly. He joined the Royal Engineers section of the Territorials four years before the war, and in 1914 was given a commission in the Welsh Regiment. In January he transferred to the R.F.C.

SAWDEN.—Lt. William Wright Sawden, R.G.A. and R.F.C., reported died of wounds received in action on June 5th, was the only son of Mr. and Mrs. W. J. Sawden, of Cottingham, East Yorks. He was 26 years of age, and was educated at Hymers College, Hull. Later, he was engaged in the corn trade, but joined the 1st Sportsman's Battalion of the Royal Fusiliers in September, 1914. In October, 1915, he received a

commission in the R.G.A., and as an expert signaller passed his examination with honours. In July, 1916, he joined the R.F.C., and got his wings in October. He was ordered to the front immediately, and had been flying abroad continuously. He was an accomplished pilot, very popular with his brother officers, and his C.O. speaks most highly of his work.

SCOTT-MILLER.—Sec. Lt. Walter Dudley Scott-Miller, Royal Fusiliers, attd. R.F.C., who was killed while flying on service on June 22nd, was the eldest son of Lt.-Col. and Mrs. Scott-Miller, Eastwood, Roehampton. He was 18½ years old.

SCOTT.—Capt. Charles Lindsay Murray Scott, N. Staff. R. and R.F.C. (previously reported missing, now officially reported killed in aerial action near Bapaume on Feb. 15th), was the only son of Lt.-Col. and Mrs. Lindsay Scott, of Whittington House, Sandgate, and nephew of General Sir Archibald Murray, Commanding-in-Chief, Egypt.

Capt. Scott came from Ceylon at the outbreak of war, and was given a commission in a battalion of his father's old regiment, the N. Staffs. He had seen a great deal of service on the Western front, and was wounded on Hill 60 in April, 1915.

On his recovery he joined the R.F.C., and after five months "observing" in France he obtained his wings in July last year, being subsequently posted as an instructor on the Home Staff. Capt. Scott returned to the front on Jan. 2nd, and was within three days of his twenty-fifth birthday when he met his death.

His C.O. writes that "he had been recommended for a 'flight' before leaving England, and would have taken over one as soon as there was a vacancy for a flight commander." He adds: "We shall all miss him very much in the squadron, as he was full of spirits and so cheery, and as a pilot he will be a very great loss, as he could always be depended on to do his job thoroughly and well."

SMITH.—Lt. Peter Smith, R.E., attd. R.F.C., killed on April 28th, was the youngest son of the late B. H. Smith and of Mrs. Berthold Smith, of 27, The Boltons. He was born in 1894 and was educated at Summerfields, near Oxford, at Winchester, and at Trinity College, Cambridge. He was in his second year at Cambridge when war broke out, and joined at once, going to the front at the end of Dec., 1914, since when he had had only seven weeks' leave. Mr. Smith had been mentioned in dispatches. His elder brother was killed in action on Nov. 24th, 1915.

SPOONER.—Sec. Lt. Raymond W. Spooner, R.F.C. (formerly L.R.B. and R.F.A.), who was killed in action on June 8th, was the second son of the late George Fraser Spooner, of London and Liverpool, and Mrs. Oxley, 70, Oakfield Road, Stroud Green, London, N. He was aged 25.

STACEY.—Sec. Lt. Douglas W. Stacey, R.F.C., died of wounds on June 20th, 1917.

STEPHENS.—Sec. Lt. Ernest Oxford Stephens, R.F.C., formerly of the Artists Rifles, has died from injuries received while flying in Yorkshire. He was 19 years of age.

STOCK.—A verdict of "Death from misadventure" was returned at an inquest in Kent on June 21st on the body of Air Mechanic Alfred William Stock, R.F.C., aged 40.

He was engaged in a hut making "powder-puffs," when a spark from the cigarette which he was smoking ignited a fuse and caused an explosion. He and two other men were seriously injured. He died in hospital.

STRINGER.—Lt. William Charles Stringer, R.F.C., who died on June 14th at the 4th London General Hospital, was the eldest son of the late William Stringer, C.E., of Manchester, and Mrs. Stringer, Parkgate, Cheshire. He was 32 years of age.

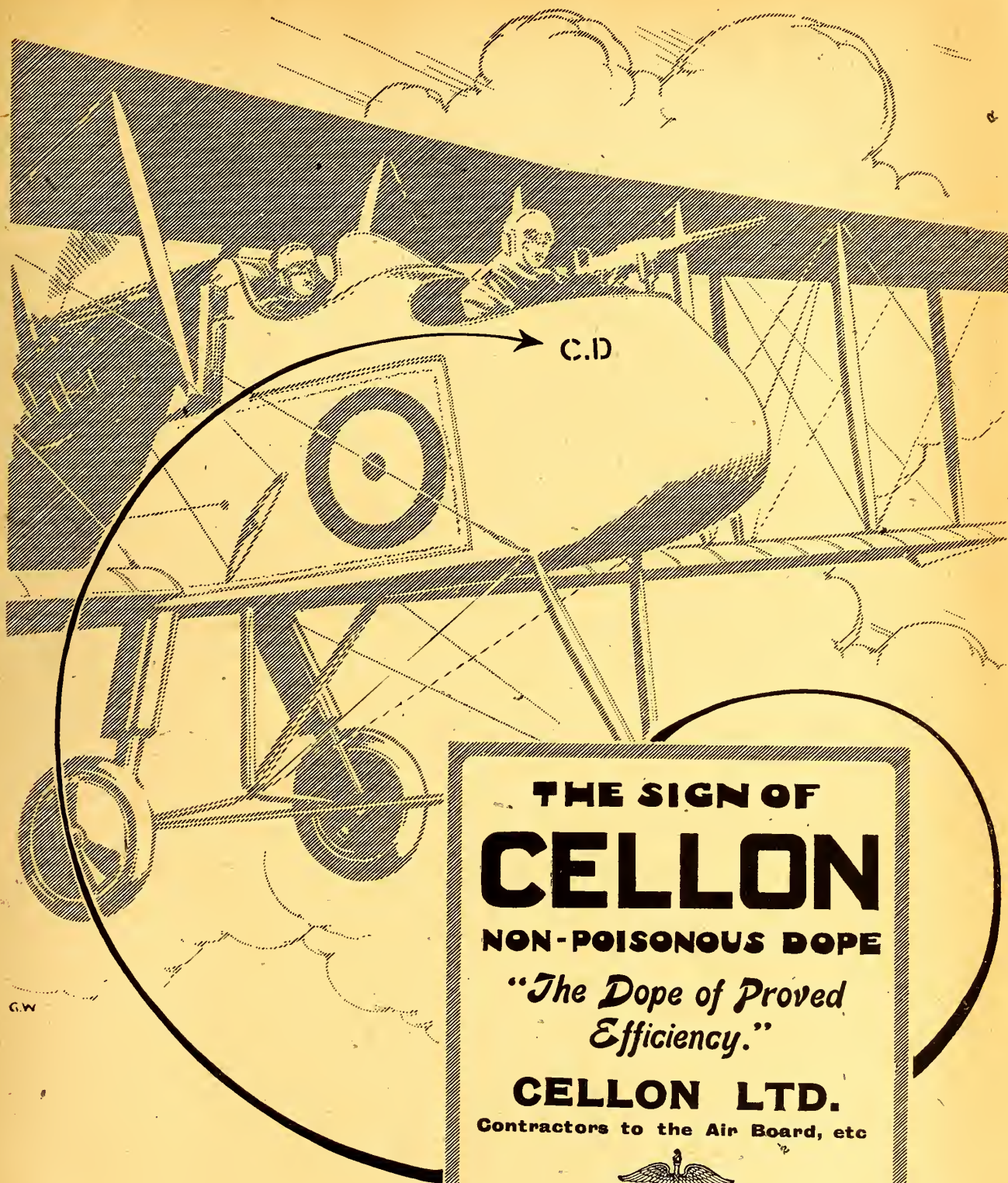
TOMLINSON.—Capt. Hugh Tomlinson, M.C., R.F.C., who died in a German field hospital on April 2nd and was the youngest son of G. W. Tomlinson, F.S.A., of Woodfield, Huddersfield, and of Mrs. Tomlinson, of 65, Iverna Court, Kensington. Educated at Lockers Park and Charterhouse, he went out to Java, where he had a tea plantation. War was declared while he was on his way home, and two days after landing he enlisted, but was rejected by the medical board. He then joined the Red Cross as a motor ambulance driver, being attached to the French Red Cross, and served in France for six months.

In November, 1915, after a course at Hendon, he was gazetted to the R.F.C., and later he was put on the night defence of London, and went up during several Zeppelin raids. During the raid on Jan. 31st, 1916, he met with a bad accident. He had a second accident in May, 1916. Capt. Tomlinson received the Military Cross in June, 1916, and was mentioned in dispatches in January, 1917, when serving in France.

His C.O. writes:—"They put up a most excellent fight against great odds; it was a wonderful performance. Your son was very popular with all ranks; the N.C.O.'s and men in his flight would have done anything for him; and, in consequence, kept things going most awfully well. One of his flying officers told me how much he helped them, and they simply did the work to please him and to keep up the reputation of the flight."

VANE-TEMPEST.—Lt. Charles Hewart Vane-Tempest, great grandson of Charles, third Marquess of Londonderry, and

(Continued on page 1680.)



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The British Aircraft Industry.

BY CHARLES L. FREESTON.

XXI.—BOULTON AND PAUL, LTD.

When the war made it necessary to extend the production of aeroplanes beyond the capacities of the aircraft industry itself, it was only fitting that a firm like that of Boulton and Paul, Ltd., of Norwich, should be prominent among those which the War Office desired to secure for its own. As workers in wood and wire they had been known far beyond the confines of the ancient city for many years, and their factories contained the materials and plant necessary for aeroplane production all ready to hand, as well as a large number of workmen whose craftsmanship was just of the kind required.

FOUNDED 120 YEARS AGO.

The works of Boulton and Paul, indeed, have been a familiar landmark in Norwich since 1874, but the firm's origin is of a very much older date. The business was actually founded in 1797, by Alderman William Moore, who opened an ironmonger's shop in Cockey Lane, and by his energy and enterprise became one of the leading citizens of Norwich. Ten years later he received the freedom of the city, and before he died in 1839 he had held various offices, including those of Sheriff and Mayor.

Meanwhile he had taken Mr. John Hilling Barnard into partnership. Later still the firm was joined by Mr. William Staples Boulton, and the firm became known as Barnard and Boulton accordingly, but after Mr. Barnard's death in 1862, the business was known by Mr. Boulton's name alone for several years. He sold the ironmongery business in 1868, and devoted all his energies to a factory, which he established three years previously in Rose Lane, under the management of Mr. J. J. Dawson Paul. Here were manufactured agricultural and horticultural implements, wire fencing, iron hurdles, park gates, and almost every kind of article, in fact, made out of iron.

REPEATED EXTENSIONS.

The manufacture of wire netting was made a staple feature in 1870, and, owing to the invention of new machines for the purpose, the firm became the largest producers of that commodity in the world. Considerable acquisitions of property in the vicinity were made, and the works were several times extended.

Numerous improvements were made in the manufacture of wire netting, while special machines were designed for compressing it into the smallest possible space for shipment to every part of the world.

Mr. Paul was taken into partnership in 1869, and in 1873, after further extensions of premises, the firm first became known as Boulton and Paul. The senior partner, however, Mr. Boulton, died in 1879, and Mr. J. J. Dawson Paul has been the governing director ever since. In 1897 the firm was registered as a limited company, and three years later Mr. Paul was elected Mayor of Norwich.

WAR WORK IN 1900.

The Boer War having broken out, the firm presented Lord Chesham's Volunteer Cavalry Corps with a hospital, which was the largest and

most expensively equipped ever sent into the field, and Mr. W. H. fiske, the eldest son of Mr. W. fiske, one of the partners in the firm, was appointed officer in charge.

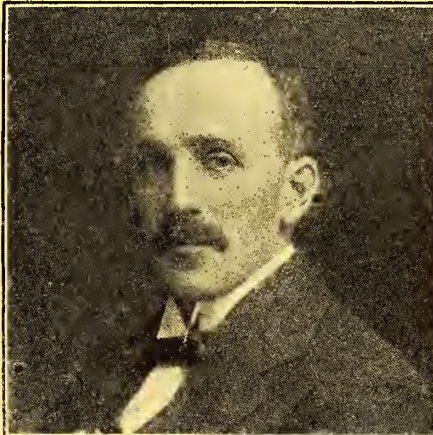
In June of that year the firm received a contract for the erection of a hospital and convalescent camp for 500 soldiers at Alton, for the "Daily Mail" Absent-minded Beggar Relief Fund. This building has since become Sir William Treloar's Home for Crippled Children. A wood-working department was started at Thorpe in the same year.

This side of the business, in fact, received a great impetus from the securing of a War Office order for £100,000 worth of bungalows for erection in South Africa. They were 80 ft. long by 22 ft. wide, and each contained a drawing-room, dining-room, four bedrooms and bathroom, with a verandah all round. Over 600 workmen were engaged upon the contract, and the buildings were shipped within three months of the order, and three large steamers were chartered for their conveyance to South Africa.

A NEW DEPARTMENT.

Five years later Mr. Henry fiske created a new department for the production of wood and steel-framed buildings for export, and this has since grown to very large dimensions. Mr. W. H. fiske and Mr. George Moore Chamberlin, D.L., now Lord Mayor of Norwich, were added to the board of directors.

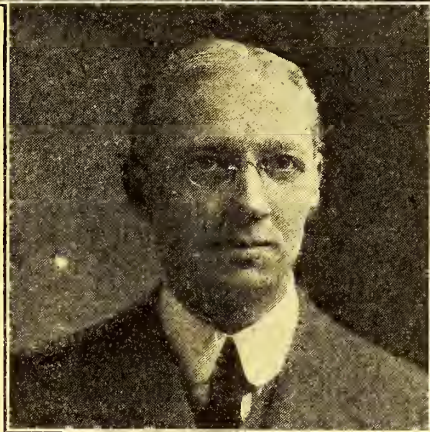
A terrible earthquake in Jamaica in 1907, led to a large order



Mr. W. H. fiske.



Mr. Geoffrey fiske.



Mr. Stanley Howes.

being received from the Government for relief quarters and bungalows. Two years later another earthquake occurred at Messina and Reggio, and bungalows were supplied to the order of the Lord Mayor of London out of the money contributed to the National Relief Fund. In 1910 Mr. (now Captain) Dawson Paul, jr., and Mr. W. H. Fiske visited Argentina and Chili and successfully established there businesses in the building and motor trades. At the Buenos Aires exhibition the company's bungalow was awarded a gold medal.

Further extensions were made at the Rose Lane works in 1912, and two years later the steam engines and boilers gave place to a 300-h.p. Crossley suction gas plant.

AEROPLANE PRODUCTION.

When the present war broke out it followed as a matter of course that the firm's resources were brought into request in respect of wooden building construction, and large orders for hutments were received from the Government. But the War Office also entrusted the firm with the production of aeroplanes of R.A.F. design, and new buildings were run up for this purpose accordingly. In the city itself there is a new aircraft factory, of which Mr. Geoffrey Ernest Fiske, who that year joined the directorate, is the manager. Previously to the war his principal hobby was yachting and motor-boating, and he was largely responsible for the design of the engine and hull of the first hydroplane built and raced in this country in 1909, and also for the machinery of the racing motor-boats, "Fugi-Yama" and "Vicuna," which won several prizes for the firm at Monaco.

Incidentally it may here be mentioned that Boulton and Paul, Ltd., has always done good work in its motor department, although that has never been a main feature of the business. At one time the firm built the motors fitted to the Ariel cars and they did excellent work, while the "B. and P." marine motor was very successful in the B.M.B.C. 21-h.p. class races. Quite a number of engines have also been built for use in small boats abroad, and have all earned a name for good workmanship.

The processes of plane construction, doping, etc., are carried out at the new works, under Mr. Geoffrey Fiske's supervision, while at the Rose Lane works there are four floors devoted to propeller making, and a very extensive plant for metal-working, nacelle building, etc., under the control of Mr. W. H. Fiske.

THE ERECTING SHOP.

On Mousehold Heath, moreover, of George Borrow fame, is a new and spacious erecting shop where the aeroplanes are put

through their final stages, under the management of Mr. Stanley Howes. At the outbreak of war Mr. Howes was managing director of a coachbuilding business in Norwich, established so far back as 1784, but when Boulton and Paul, Ltd., were asked by the War Office to undertake the making of aeroplanes they invited Mr. Howes to participate, and not only his own services but those of his men were devoted to this new branch of work. Mr. Howes is responsible for the final stages and testing of the aeroplanes at Mousehold, where he has, as manager of the erecting shop, in Mr. J. Law, an old habitué of Hendon and Brooklands. Mr. Howes accompanied Captain Pixton as passenger to Farnborough in the first flight made by a Boulton and Paul machine.

NEW DEVELOPMENTS.

Messrs. Boulton and Paul recently accepted a contract for the production of a well-known type of fast aeroplane, while only a day or two ago they decided to launch out still further in the aircraft industry, and will be heard of eventually as designers on their own account. They have the fullest confidence in the commercial future of aviation, and have no intention whatever of quitting the industry when peace is declared.

In the course of a tour round the numerous workshops of the firm, in the several establishments in the town and on Mousehold Heath, I could not but be impressed with the many indications of efficient management in every department of this very large and old-established business. Particularly pleasing, also, were the evidences, which were patent on every hand, of the happy conditions under which the workpeople of both sexes carry on their labour. The workshops are up to date in every respect, while the Rose Lane factory is a building with special claims to architectural attractiveness. The canteen arrangements are remarkable for comfort and completeness, a special two-storied building of handsome design having been erected for this purpose by the firm, while the catering arrangements are under the direction of ladies of the city, in connection with the Y.W.C.A.

Mention must not be omitted, moreover, of the very useful service which is effected by the "B.P. Magazine," as a means of maintaining an agreeable *esprit de corps* among the employés of the firm. This magazine, which is edited by Mr. J. F. Archer, is probably the best and most ambitious product of its type, being well printed on good paper, and embellished by photographic illustrations of conspicuous excellence.

THE ANNUAL MEETING OF PETTERS, LTD.

The seventh annual meeting of Petters (Limited) was held on June 14th at the registered office of the company, Nautilus Works, Yeovil, Mr. Ernest W. Petter (chairman of the company) presiding.

The chairman, in moving the adoption of the report, said:—During the year our engineering works have been kept fully employed on Government work, and, I am glad to say, largely in the manufacture of our own product, namely, the Petter oil engines, for Government uses. We have also been engaged at our Westland Foundry on war material, and have laid down there the beginnings of a steel foundry, from which we are already getting a certain amount of output, which we hope to increase in the future. I need hardly tell you that the large extensions at Westland are putting a heavy strain on our capital resources, and we have recommended negotiations with the Treasury with a view to obtaining sanction for increasing our capital at an early date. If this is received we shall in every way study the interests of our existing shareholders. People come to me and suggest that we must be making "pots of money" out of the aircraft business, and I am glad of the opportunity of replying to these suggestions now. We have not distributed any profit arising from the aircraft undertaking, and the whole of the dividends which we are now paying have been earned by and will be paid out of the engineering department accounts.

The excess profits legislation effectually removes all suspicion of profiteering so far as our business is concerned, and such legislation is justified provided that it is applied on reasonable lines and with proper allowance for upkeep and depreciation, but it must be applied in accordance with sound business principles, or the Government will bring ruin upon the engineering industry. During the year we have acquired the controlling interest in the Westland Estate Company (Limited), which was the company that held the land adjacent to our works, and in which several of our directors were interested. The shares in that company have been purchased on the basis of actual cost price, without interest, and no profit has been made on the transfer by the previous holders of the shares. This arrangement has been of great advantage to the company. Last year I dealt very largely on the question of the future of labour, and the difficulties to which I then referred have not become less. The policy of the directors, however, will be, as it has always been, to pay good wages and demand a fair return in work, while showing consideration to the employees of the company.

I should be failing in my duty if I omitted to acknowledge the fine spirit that has been shown by our managers, heads of depart-

ments, clerical staff, foremen, and workmen, and not least by the lady employees of the company in all departments, the numbers of which have been immensely increased during the year.

I might add we subscribed for £10,000 of the recent War Loan, and we purchased on behalf of our employees 5,200 War Savings Certificates, which are being paid for in instalments.

The resolution was seconded by Mr. Vincent and carried unanimously.

The payment of a dividend on the Preference shares at the rate of 6 per cent. per annum for the half year ended March 31st, 1917, less tax, and the payment of a dividend on the Ordinary shares at the rate of 10 per cent. for the year, free of income-tax, less interim dividend already paid, were approved.

Mr. W. N. Baines was re-elected a director of the company.

The re-election of Messrs. Felton and Co., of Birmingham, as auditors to the company for the ensuing year was carried unanimously. Mr. R. A. Felton, in returning thanks, stated that, in his opinion, the directors were justified, under the special circumstances and with the information already obtained, in declaring a dividend without waiting for the final accounts.

On the motion of Mr. P. W. Petter, seconded by Mr. R. A. Bruce, the meeting was adjourned until such time as a settlement with the Ministry of Munitions could be arrived at and the balance-sheet and accounts be presented.

A BRITISH-BUILT AND BRITISH FINANCED MAGNETO.

Under the style and title of the British Lighting and Ignition Co., Ltd., a company has been formed to manufacture, in England, magnetos of the very highest grade. The fact that the great engineering firm of Vickers Ltd. has been responsible for its inception, and holds the whole of the share capital, is a distinctly encouraging sign.

Under such auspices, one feels certain that the productions of the new company cannot fail to be fully equal to the best magnetos that have yet been constructed, whether English or foreign, and that the day of our dependence for magnetos on the alien is now over. The name chosen for the magnetos is the "B.L.I.C.," from the initials of the company.

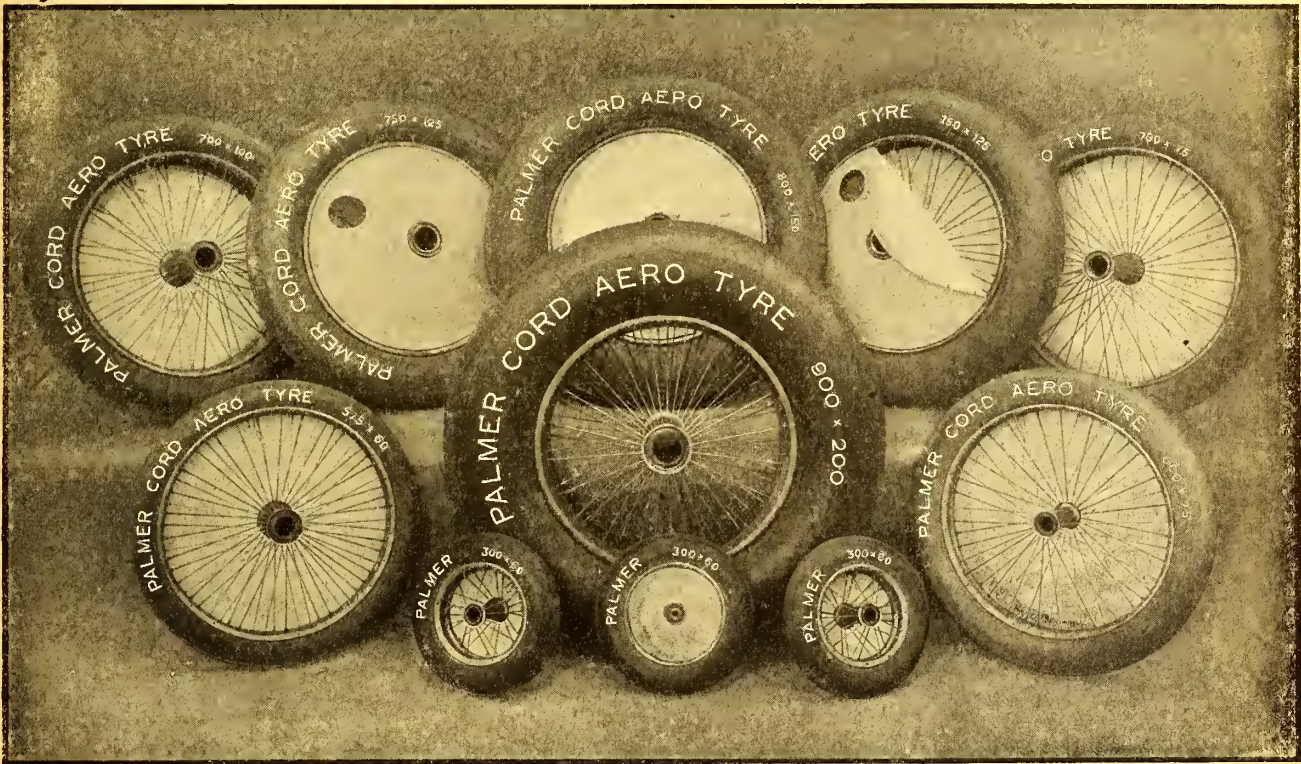
The works of the new company are in full blast, and hundreds of magnetos are being turned out weekly to meet the requirements of the Authorities, and all possible preparations are being made with a view to coping with the tremendous demand that is certain to arise after the war. The offices and showrooms of the company are at 204, Tottenham Court Road, London, W.1.



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		Length	Bore				Length	Bore				Length	Bore	
300×60	16	m/m	m/m	m/m	700×75	75	m/m	m/m	m/m	750×125	26	m/m	m/m	m/m
"	17	111.12	25.4	Central	"	*80	178.	31.75	132/46	"	33	150.	40.	Central
450×60	30	72.39	12.7	Central	"	*91	178.	44.45	132/46	"	66	178.	38.09	Central
575×60	14	89.	31.75	Central	"	*98	178.	31.75	132/46	"	96	178.	38.89	132/46
"	21	150.	38.09	104/46	"	2	178.	44.45	Central	"	"	178.	55.	132/46
"	34	160.	28.	Central	700×100	4	185.	55.	135/50	800×150	8	185.	55.	135/50
650×65	9	150.	31.75	104/46	"	18	185.	55.	Central	"	10	185.	55.	Central
"	20	178.	44.45	132/46	"	26	178.	44.45	132/46	"	†36	185.	55.	135/50
"	75	178.	38.09	132/46	"	33	150.	40.	Central	"	†40	185.	60.32	135/50
600×75	14	178.	31.75	132/46	"	66	178.	38.09	Central	900×200	42	185.	60.32	125/60
"	21	150.	38.09	104/46	"	96	178.	38.89	132/46	"	47	185.	55.	125/60
"	34	160.	28.	Central	750×125	2	178.	55.	132/46	1000×150	97	250.	65.4.	Central
700×75	9	150.	31.75	104/46	"	4	185.	55.	135/50	1100×200	52	185.	55.	116/69
"	20	178.	44.45	132/46	"	18	178.	44.45	Central	"	57	185.	55.	Central
"		178.	38.09	132/46	"				132/46	"				

*Wheels Nos. 80, 91 and 98 are fitted with a wider and stronger rim, and the 700 x 75 tyres when fitted to this rim caliper 83 m/m.

†Wheels Nos. 36 and 40 are of stronger type than the other wheels for 800 x 150 tyres.

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FRONT END STRUTS.

At the front end of the fuselage we will assume that four ash struts are required, two each side, for stiffening the fuselage and attaching the engine plate. These will be flush on the inside and sunk and lightened on the outside, right and left-handed. As these struts have to bear considerable strain and vibration, quality of timber and fine straight grain is again essential. The front struts will be about 2 ft. 5½ in. long, 5 in. wide and 1½ in. thick, with the ends tapered down, on one edge only, to ¾ in.

Commencing at 7 in. from each end, the "sinking," or lightening is commenced at 7½ in. on either side of the centre of length and is carried towards each end of the strut, diminishing in width as the end is approached, the lightening stopping at 2½ in. from the end (see Fig. 5) with a margin or flange at the sides ¾ in. thick.

Before cutting up an ash plank it will be best to get the wood setter-out to mark off the outline of the strut on a mahogany board, taking care to leave an excess of at least ½ in. on all sides of the outline to allow for shrinkage and cleaning up.

The template having been cut out and completed and checked by the inspection department, with the drawing, it will be sent to the wood marker-off, who will go to the machining shop and mark off the outline on the selected ash plank, which can then be taken to the band saw. These ash struts may then be cut out, after which they can be sent to the wood-finishers' benches to be finished and then passed on to the marker-off to set out the lightenings, which will be done on the spindle.

CROSS STRUTS AND FUSELAGE SPARS.

We can assume that the cross struts for the front part of the fuselage consist of 1½ in. square spruce, which must again be of exceptionally good quality, and long, fine grain. This must be cut from a selected plank and put through the thicknessing machine, after which it can be sent to the wood-finishers' benches to be cut up into the correct lengths, plus ½ in. to allow the erectors to fit and bed the ends to the top longeron and the front bottom fuselage spars which form the bottom longitudinal members of the fuselage.

These will be of ash, about 6 in. deep by 1½ in. thick, and,

say, 6 ft. 6 in. long, tapering down to 1½ in. square at the rear end, with three lightenings in the centre, each side (see Fig. 6).

A template of this should next be made, not forgetting the ¾ in. full over finished dimensions to allow for shrinkage and cleaning up to 1/32 in. full. The template being made, the marker-off will mark off the outline on the ash planks. These can then also be sent to the bandsaw and then sent to the wood-finishers' benches. The ash struts and the front bottom fuselage-spars can all now be taken to the marker-off, who will outline the lightenings in pencil, and then they will be sent to the wood machining department to have the lightenings cut out on the French spindle, each lightening being done half at a time, and reversed upside down to finish the uncompleted half.

We will assume the lightening is ¾ in. deep each side, and the radius at the sides ½ in. The spindle work being done, it may be necessary for them to be sent to the wood-finishers to have the lightenings cleaned out where the spindle did not reach, as is sometimes the case. After this has been done the whole lot can be sent to the inspection department to be passed and stamped.

THREE-PLY TIES.

On the assumption that the design of the machine is fairly modern, and as adopted in a few cases, we will arrange for the front part of the fuselage to be tied together with ¾ in. three-ply, with lightening holes cut out in accordance with the plan. These will be set out on one sheet of three-ply, which should be large enough for this purpose, to avoid joints which would constitute a grave weakness.

The first sheet having been outlined and this passed, it can be laid on ten other sheets and the lot fastened together with fine wire nails, which should be plentiful, and placed principally on the part of the three-ply to be cut out, about 2 in. pitch.

If this is not done, damage may be done to the edges of the three-ply by the jigsaw. After this is done the sheets of three-ply will be taken to a drilling machine, and 1 in. to 1½ in. holes should be drilled in each lightening to be cut out, to enable the jigsaw operator to pass the jigsaw blade through.

When all the lightenings have been cut out, the sheets can be sent to the wood-finishers' benches to be cleaned up, ready for

ASH FUSELAGE
STRUTS



FIG. 5.

FIG. 5.

FUSELAGE SPAR.
ASH

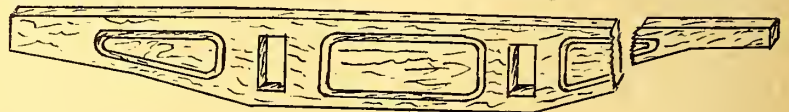


FIG. 6.

BOX JIG FOR
SPINDLING STRUTS

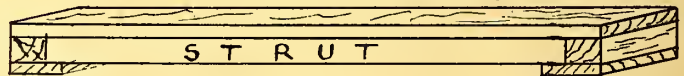


FIG. 7.

passing by the inspection department, and put in the finished part wood stores ready for issue to the erecting shop.

The next part to be provided will be the ash distance pieces for the rear portion of the fuselage in line with the front spar of the tailplane, these will be of ash and be about 1 ft. 3 in. long by 5 in. wide by 1 in. thick, lightened out, this work being done in a similar manner to the front ash struts.

The three-ply covering at the top and bottom and sides of the fuselage for strengthening and tying the rear end of the fuselage together can be now cut out in the same manner as described for the front ends.

THE STERN POST.

The ash stern post can now be put in hand. This will have to be of exceptionally good material, to avoid being rejected. It may be assumed that it is about 1 ft. 8 in. long by 4½ in. by 1½ in., with bevelled edges, to suit the contour of the sides of the fuse-

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lage, this will preferably be cut out of a rift-sawn plank (see Fig. 1), as the grain in this case will afford the most suitable strength.

The upper portion of the post being cut away each side on the band saw, and finished on the bench, the bevel can be done on the planing machine or on the French spindle.

UNDER-CARRIAGE STRUTS.

The struts for the landing chassis can now be put in hand, these must be made from spruce of clean straight grain, which is the extent of the specification for struts for this purpose, of course free from resin and any shakes, the length being 4 ft. 2 in. by 7½ in. by 2 in. streamline section with ends cut and bevelled on two angles to support the fuselage, and the other or lower end to be fitted into the sheet steel fitting.

The timber having been selected and the template of the outline having been cut out ½ in. full, the outline can be marked out off the template on to the spruce plank, which has been cut down from a larger and thicker plank, and planed up both side to 2½ in. thickness. It is then taken to the band-saw and cut out to the outline, leaving each end 3 in. long, after which it is necessary to finish it up to the approximately finished streamlined section and dimensions, which can be done on the spindle, in a semi-box jig which covers the strut to be spindled, but which supports it and holds it in position (see Fig. 7), the edge of the jig which presses against the spindle being curved or contoured according to the design of the strut.

A Box Jig.

The jig will consist of a board about 5 ft. long 9 in. wide by 1 in. thick. At a distance apart of 4 ft. 8 in., securely fix two stout cross-battens about 9 in. by 3 in. by 2 in. to the board, on the top of these cross-battens, glue and screw a piece of hard wood 9 in. by 4 in. by ½ in. so as to form a rabbet of the cross-battens, and along one edge of the board on the same side as the cross-battens glue and screw a longitudinal batten or strip 1½ in. wide and 2 in. thick.

Into this space the strut is placed, and the cutter of the spindle having been accurately ground up to a contour of quarter of the whole streamline, all that has to be done is to pass the jig containing the strut in its unformed state, past the cutter on the spindle. A quarter of the strut is now practically formed accurately; the next thing for the spindle hand to do now is to slide the strut out and do the opposite side in a similar manner. One half of the strut is now complete, namely, the side next to the table of the spindle. Take out the strut, reverse its position in the jig, and repeat the two previous operations, and the machining is complete, it can now be sent to the wood-finishers' benches to have the ends trimmed, and to be cut nearly to the required length.

(To be continued.)

N.P.L. METHODS.

On various occasions reference has been made in this paper to the unsatisfactory way in which the National Physical Laboratory performs its duties as a public institution supported by public money. Either the officials of the N.P.L. treat private individuals in an off-hand manner, which is simply offensive, or they reply in such a way as to show that they have not taken the trouble to understand what is being asked of them.

The following correspondence seems a fair example of N.P.L. methods:—

Dear Sirs,—The writer is engaged upon a study for the utilisation of wind power, which he intends putting to the test upon the termination of the war, and in conjunction with these plans he considers it desirable to make a series of tests with blades of various designs and arrangements.

The best designation he could give to the apparatus he has in view would be a "Wind Turbine," and the purpose of these lines is to ascertain whether the wind tunnel and test mechanism at the National Physical Laboratory would be available for such experiments, and, furthermore, what would be considered the most appropriate size for such models.

In order to arrive at useful results, it is intended to utilise different diameters for the models in question so as to obtain comparative results and at the same time to find out how an increase of diameter with varying blades will affect the efficiency.

Assuming your answer to be generally favourable, we should further like to know whether it would appear desirable to have complete model wheels or whether the effect could be equally well measured with single blades or vanes, bearing in mind that the idea is to utilise not only rotors proper, but also stationary or guiding blades for deflecting the direction of the wind current upon the blade.

Your speedy reply will be appreciated by, Faithfully yours,
May 18th, 1917. (Signed) GEO. W. GOODCHILD.

The National Physical Laboratory replied as follows:—

Dear Sirs,—I am in receipt of your letter of the 18th inst. (reference GWG/MT). In reply, I regret to have to inform you that we are unable at present to undertake the investigation referred to. The equipment available for such work is entirely

occupied with urgent war work, and it would not be possible to carry out at present an investigation of the kind proposed.

Yours faithfully,

May 23rd, 1917. (Signed) R. T. GLAZEBROOK (Director).

[One assumes, of course, that Sir R. T. Glazebrook merely signed the letter and had not read the correspondence.—Ed.]

Mr. Goodchild then wrote thus:—

Dear Sirs,—We wish to thank you for your favour of the 23rd (reference as above), and are afraid that you somewhat misunderstood the meaning of our letter of the 18th. We did not intend to proceed with the experiments now, since they require a lengthy preparation and careful study, before the models, which will be expensive, could be produced, and our letter was intended more to obtain some guidance with regard to the requirements of such tests so as to prepare everything for starting making the models when war work comes to an end.

We fully appreciate the greatness and importance of the work on which the equipment is at present occupied, and it never occurred to us that our investigations should, in any way, interfere therewith.

Perhaps you will reread our letter of the 18th in view of the foregoing, and give us some indication with regard to the lines on which such tests might be conducted, as the writer, in his leisure time, intends to work out all the details of the models in question.

Trusting to hear further from you, We are, Faithfully yours,
May 24th, 1917. (Signed) GEO. W. GOODCHILD.

The National Physical Laboratory replied:—

Dear Sirs,—We are in receipt of your letter of the 24th inst., and note that the experiments suggested in your letter of the 18th were intended to be carried out after the war, which was not clear to us previously. It is, however, not possible for us at present to enter into an undertaking to carry out such experiments at a future date, and in these circumstances we do not desire to attempt to lay down the conditions under which such experiments might be made. Yours faithfully,

May 26th, 1917. (Signed) R. T. GLAZEBROOK (Director).

Mr. Goodchild terminated the correspondence thus:—

Dear Sirs,—We have your letter of the 26th and must say that the contents thereof are very disappointing and discouraging.

We are not aware of having asked you for an undertaking to carry out the experiments we have in our minds, since there are other installations which might be more willing to assist us in the matter. Being, however, under the impression that the National Physical Laboratory would be able to offer us a guiding hand, we ventured to ask for your advice so as to ensure a sound and satisfactory basis for the experiments we have in mind, and which we feel might eventually prove of considerable value to the industry, not only of this country, but also of the Colonies, and other countries where coal is difficult to obtain, and, therefore, expensive, and where we can reckon with regular periodical air currents of considerable intensity.

Faithfully yours, (Signed) GEO. W. GOODCHILD.

[Thus, one perceives how enterprise is encouraged by officialdom in Great Britain, and how in time of war our officials assist our preparations for peace.—Ed.]

THE N.P.L. MEETING.

The annual meeting of the General Board of the National Physical Laboratory was held at the Laboratory on June 19th. During the past year, according to the annual report, the Laboratory has been closely engaged, with a largely augmented staff, of whom more than one hundred are women, with a variety of researches and investigations arising out of the war, and has dealt with a greatly increased volume of test work for Government Departments. The outstanding feature of the year has been the growth of the gauge testing work. Nearly the whole of the gauges required for the inspection of munitions are now examined at the Laboratory, the number averaging about 10,000 weekly. By arrangement with the Ministry of Munitions a new building has recently been erected to accommodate the work, the space otherwise available having become quite insufficient for the purpose. There has been a great increase also in the number of optical and electrical instruments tested for the Admiralty. A new branch of work is the testing of luminous dials for instruments of various kinds. The Laboratory is at present under the control of a General Board (with Sir J. J. Thomson as chairman) and an Executive Committee (of which the chairman is Lord Rayleigh), appointed by the Royal Society and the great technical institutions, and the researches are assisted by a grant from the Treasury. The income during the past year was over £70,000, an increase of nearly £20,000 over that of the preceding year. Much attention has been given recently to the question of the future of the Laboratory, and in particular to its relations with the Department of Scientific and Industrial Research, and a scheme will no doubt be arranged whereby close relations with the departments will be established.

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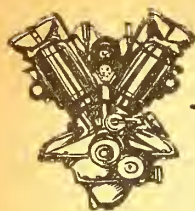
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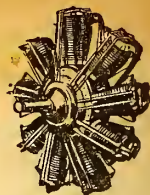
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AERO-MOTORS

IN KIND AND CONSTRUCTION

By Geoffrey de Holden-Stone



MANY INVENTORS.

Lightning, we are told, never strikes twice in the same place; because it never needs to. That is where ideas—or what pass as such in Southampton Buildings, W.8—differ from lightning. Evidently they do strike twice in the same place; that being, somewhere in the near east-end convolutions of the average inventor's brain—as alleged—because of the clear need of such repercussion.

That is only the charitable view of the matter.

The psychological or spook-parlour one is that ideas which were still-born or died without chrism or consummation—otherwise wholly unlamented—go wandering and whimpering about the middle air for certain years until they can find a new and empty brain, swept and garnished, to give them another lodging and embodiment.

The common-sense, police-court opinion—to which I heartily subscribe, as the only subscription which costs nothing—is that inventors will rob the very dead—the deader the better—if they see a chance of subsequently robbing the living thereby. I have seen them about their foul trade. They will furtively disappear into one of those catacombs marked 1880-1884 of the Southampton Buildings mansolam, rifle some wretched corpse-patent of its back-teeth and collar bones, rings and coffin-plate, and then a week or so later, produce some reconstructed skeleton which they declare shamelessly to be their own invention. If you are not careful they will ask you to procure them moneys to work it. Or, actually, to work you. That is how they live without working.

However, in a certain rare book called "501 Mechanical Motions," which I keep by me as a sort of Stone's Justices' Manual, I can generally confront them with the pictured reconstruction of their own crime, or one like it, committed years before they were born. Beyond which, I can generally trust my own memory of such things, still fairly clear. So I am enabled to remain safe in their company.

AND VERISIMILITUDES.

On the other hand, from the evidence of many recent cases, I am driven to conclude that none of the hard worked examiners of motor patents possesses a copy of that book, or else has no memory of anything behind the last dozen years or so. Otherwise, how could these wholesale resurrections have got by as patents? In some, it has been difficult to see where patentable subject-matter lay; or aught that would or might not as well have been done as a commonplace of shop-practice; or the particular value of the notion anyway. And in one case the mass-design—desperately proposed as an aeromotor, in combination with doubtfully original detail—was positively classic; being the model of the original "dog-cart" of a certain famous firm; which model was itself only the automobile edition of the Koch marine motor. It is not so much that one gasps and wonders "How are these things done," so much as why they are done. Because they utterly spoil the market for really good things.

Still, there are cases of positive resemblance which from the nature of circumstances seem wholly beyond the longest reach of coincidence: and are, therefore, the more curious and interesting. Two of them are before me now. One is the Gobé-Diard two-stroke rotary; which was exhibited in Paris in 1912, then apparently went asleep, and now, I hear, is being remanufactured. The other is one that was known in the U.S. as the "R.C.," of which I have kept the descriptive illustration for a mere fifteen years, despite all tidings-up and torpedoings and like frightfulness. Which is again interesting, for as a sleeve-valve-and-port proposition, it clearly anticipates even the famous S.K. idea by a few summers, and with a single-sleeve operation at that.

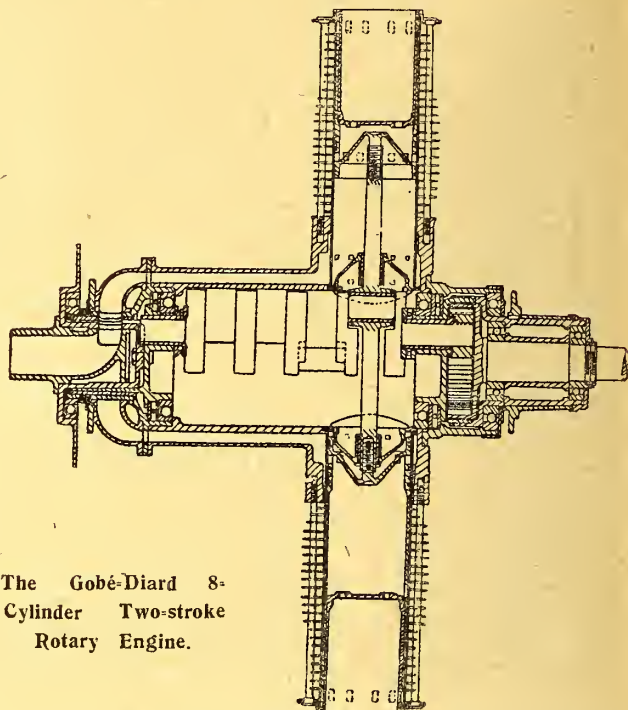
A SLEEVE-VALVE ACTION—VINTAGE 1901!

Now age gives priority for comparison, so one may discuss the original first, if only to illustrate the points of the system. In those days, too, motor-publicists wisely considered that a maker would probably know more about his own motor than anyone else; so cheerfully printed all he had to say about it, without comment, edition, or any of that responsibility for the contrivance which readers seem to demand in these days.

So I cannot do better than quote the necessary fragments of the more closely descriptive paragraphs: thus

"... the piston and port design. The piston is cast with an extension or sleeve above its head, as shown... machined outside where it fits the cylinder, and inside to receive the re-entrant cylinder-head.

"The lower series of ports round this extension, just above the piston-head proper, are the by-pass or transfer ports, and those at the upper end are the exhaust ports. These ports,



The Gobé-Diard 8-Cylinder Two-stroke Rotary Engine.

at the proper point in the stroke, are brought into register with two corresponding series of ports in the cylinder wall. The crankcase inlet ports, like the others, extend all the way round the cylinder, and are uncovered by the lower end of the piston during the upper portion of the stroke."

Notice now, that this R.C. motor was a stationary vertical marine affair; and having no differentially-sized lower end, nothing but crank-chamber induction was possible. At the same time, however, note that the induction and exhaust ports were at opposite ends of the working chamber, thus anticipating the latest and most advantageous physical developments of two-stroke design by fifteen years.

FURTHER ANTICIPATIONS.

And noticing all this, we shall be better able to appreciate the special points, later on, of the Gobé-Diard; in which, though the mass of these sleeved-piston mechanics is the same, other mechanical features—chiefly due to the fact of it being a rotary—enable further physical advantages to be duly exploited without the aid of a differential lever extension. However, let the pioneer continue to speak his piece; all the more because it is all so obviously true.

"... As compared with the ordinary type of two-stroke engine"—in those days the Day-type was the one and only two-stroke conception in the U.S.—"this construction affords many advantages. The ports in every case extend all the way around the cylinder—instead of less than half-way round—giving thus more than twice the port area that is possible with the usual piston construction. Because of this large area, there is no difficulty in proper charge transference: the result being a very flexible engine and one in which the power increases with the speed."

Which result the Day-type positively refused, and does still, if you may judge from its survivals in motor-cycle practice.

"The piston has more displacement at its crankcase end than at its upper one"—owing, of course, to the depth of the dependent cylinder head—"the difference being almost exactly equal to the volume of the compression-space; so that the cylinder is almost perfectly scavenged at each revolution."

All the rest was mere specification stuff, probably out-of-date by this time. The really interesting thing, on the other hand, is that although this designer—like most of his kind then and since—was whooping about scavange as a primary result, he had actually obtained—and fifteen years ago, too—forced induction, owing to the static action of that cylinder head combined with the aforesaid difference of contained volumes at both ends of the piston. Which last feature—as will be seen later on—seems to

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be just what is missed in the Gobé-Diard design. Likewise—and for the same physical reasons—he has realised the ideal one-atmosphere absolute-pressure transference; in the non-recognition of which, as a fundamental physical feature of the cycle, so many otherwise promising two-stroke propositions have come undone.

Which, as he never so much as refers to either result, shows how much sheer, blind chance enters into the motor-design schemes to make or mar them.

AND THEIR FRENCH DEVELOPMENT.

Coming now to the much more highly elaborated, though even simpler Gobé-Diard. Simpler, merely in the mechanical sense, the elaboration, as in all the most advanced examples of two-stroke practice, coming in by way of slight relative movements producing definitely multiplied and positive effects.

As will be seen, the mass-resemblance is comprised in the single centrally-secured cylindrical piston and deep port-like cylinder-head bolted down to the crank-chamber. Also, in the relative position of the inlet and exhaust ports at opposite ends of the piston-sleeve and combustion chamber; exhaust above and inlet below.

There, however, all resemblance ends: and the differences—as well as the rest of the design-scheme—are made up of curious details, of special shaping rather than substance. Which last is itself the great artistic difference between two-stroke and four-stroke developments: as the latter seem hardly enabled to grow—to judge from some of the latest examples—without running hopelessly to seed.

Actually, the Gobé-Diard as it was had four pairs of cylinders; as, indeed, the cranks indicate, although only one pair is illustrated herewith to show the working scheme. But as will be seen—the motor being of the rotary group—there is nothing to prevent the installation of a further eight cylinders, plus-sign fashion + instead of four opposed ones in I-form pairs.

THE MECHANICAL ACHIEVEMENT.

However, each such pair is co-axial; and as will be seen, owing to the combination of the rotary action of the motor mass with the eccentricity of the crank-shaft axis in addition thereto, the opposed pistons can be secured to their common crank-pin by true *rigid* piston rods, each reciprocating in a stationary gland. Thus, the under side or lower half of each sleeve-piston can be used as a charge-pumping, primary induction, force-feed-delivery chamber, without any differential-enlargement of the piston and cylinder: a result otherwise mechanically impossible, despite its obvious advantages, except in a motor with oscillating trunnion-supported cylinders—such as the Williamson marine motor—a type that would be clearly out of the question as an aeromotor.

Thus, the Gobé-Diard design realises just the object wherein the Renault two-stroke attempt, with its transversely sliding trunnioned gland, failed for mechanical reasons.

AND THE MECHANISM.

Now that terrible sentence “the combination of the rotary action of the motor-mass with the eccentricity of the crank-shaft axis” sounds like a Chaplin motor-school incident. But a moment's careful examination of the sectional drawing will show that is an exact statement of fact. Notice in the first place that the end-journals of the crank-shaft are mounted, with their sleeve-bearings, eccentrically within two drum-like bodies; and that the rearward one of these bodies is rigidly held within the end of the inner or non-rotating portion of the crank-chamber.

Secondly, notice that ball races are mounted outside these drum-like bodies, on which the motor-mass rotates concentrically with their axis and its own, but eccentrically with the crank-shaft axis.

But thirdly, observe that the forward end of the crank-shaft carries a pinion meshing with an internally toothed wheel carried on the inner end of the hollow propeller-shaft; the axes of the latter, of the toothed wheel and of the motor-mass being identical.

Two things will now be seen: the first, that the combination of these parts and their respective axes is such, and the length of the crank-throw such, that the eccentricity of the crank rotation to the axis of the motor-mass exactly counterbalances the eccentricity of the motor-mass to the crank-shaft axis. Consequently, these just cancel out, and there is no oscillation of the rods, the motion of which thus remains coincident with the cylinder axis.

THE WORKING RESULT.

This mechanical result alone enables the lower portion of the sleeved-piston—underside—to perform its work as a primary induction and charge pumping chamber, in combination with the fixed crosshead.

The second thing is, that the difference in the number of teeth of the pinion and the gear-wheel is such that half of the pinion motion is spent in eccentric travel—or revolution—within the gear: only half remaining for true rotation—and transmission of rotary motion—from the teeth of the one to those of the other.

Consequently, there is no reduction of the propeller-shaft speed, the latter rotating in one direction as fast as the motor-mass—its complement on the same axial line—rotates the opposite way.

(To be continued.)

ITALY AND COMMERCIAL AVIATION.

Two big companies for aerial transport and business connected therewith have been registered quite lately, not unconnected with the Government's overseas postal contract, one gleams.

The bigger concern appears at Naples, and takes the form of an increase of capital on the paid-up capital of an already existent firm there. Ten millions of lire is spoken of by business papers as the new figure.

Meanwhile, a large affair is being floated at Milan by very well-known men, holding, most of them, really live positions in their different professions. The Mayor of Rome, Prince Colonna, a member of the great Borromeo family; Comm. Gianni Caproni, and Signor Lawrence Santoni are among those mentioned as being present, or represented at, a recent council in connection with this “International Aerial Transport” Company. Postal services all over the Mediterranean in connection with the lines from the Allied capitals are the primary objects of the Society. The mountains are labouring—. The remainder of the proverb must not be even thought of.—T. S. HARVEY.

THE LEATHER SHORTAGE.

Now that leather is almost unobtainable for ordinary purposes, many engineers will be interested to learn that Ferodo fabric can be used with every confidence for coupling joints. A user has recently reported that “Ferodo Fibre has stood up in joint form very much better than equal thicknesses of best chrome leather.”

Where little or no flexion is required, Ferodo Fibre will prove most satisfactory. The makers, the Herbert Frood Co., Ltd., Chapel-en-le-Frith, will be very pleased to render assistance in solving the problems of aircraft manufacturers wherever questions affecting leather or fibre are concerned.

Ferodo Fibre is already a household word wherever brakes of any kind are concerned, and its use for other purposes contradicts the ancient saying that “There is nothing like leather.”

A NEW AIRCRAFT CONCERN.

Messrs. Thomas Lowe and Sons, of Curzon Street, Burton-on-Trent, a very old established firm of contractors who started work in 1825, and who have specialised in high-class joinery work, have entered the Aeronautical Industry, and will be pleased to receive inquiries for the manufacture of spares, component parts or complete machines. The new department will be under the control of Mr. J. G. Navarro, late technical designer and managing director of the Navarro Aircraft Co., Ltd. Mr. Navarro has had nine years' experience of aircraft work, and is therefore very fitted to his new post.

Any work entrusted to the firm will be carried out in the very best manner, and great attention will be given to details.

COAN CONTINUES CASTING AND CHARITY.

The recent announcement that R. W. Coan, Esq., of the Aluminium Foundry, 219, Goswell Road, E.C., had accepted the Presidency of the Clacton-on-Sea Advancement Association, has apparently given rise to a belief that Mr. Coan is not only retiring from business, but also intends resigning the many offices he holds in various fraternal and benevolent associations.

Mr. Coan therefore wishes it to be distinctly understood that he is still giving the whole of his business hours to his firm, particularly now, when he is so busy with war work, and is just starting to operate two large extensions to his foundry, where he hopes to continue to “Cast Clean Crank Cases” for many years to come. Also, while devoting a portion of his summer week-ends to the interests of Clacton-on-Sea, he has no intention of neglecting his interest and activities in the many other organisations of which he is a member.

THE SCIENTIFIC MIND.

A correspondent, apparently residing at Mill Hill, writes:—“Dear Sir,—Could you send me figures for converting monoplane values of Ky and Kx coefficients into triplane values? Have they been accurately valued, as have biplane values?”

“Also could you let me have any other details of triplane formulae differing from biplane figures?”

“Would a triplane twin tractor, of 200 h.p., with a speed of 65-100 m.p.h., climb of about 800 ft. a minute, useful load 200 lb., be any great use at the present moment as a fighter?”

“Would R.A.F.6 wing-section be suitable for a machine” . . .

There the letter ends, without a signature and without completing the sentence. The thirst for information is praise-worthy, but the omission of the signature and of the end of the sentence is somewhat regrettable. It is such little lapses of memory which confirm one's doubts as to the reliability of the scientific mind when confronted with practical matters.

A CHANGE OF NUMBER.

It should be noted that the telephone number of S. E. Saunders, Ltd., designers and constructors of air and marine craft, of East Cowes, Isle of Wight, which has hitherto been “Cowes 493” is now “Cowes 193” (four lines).



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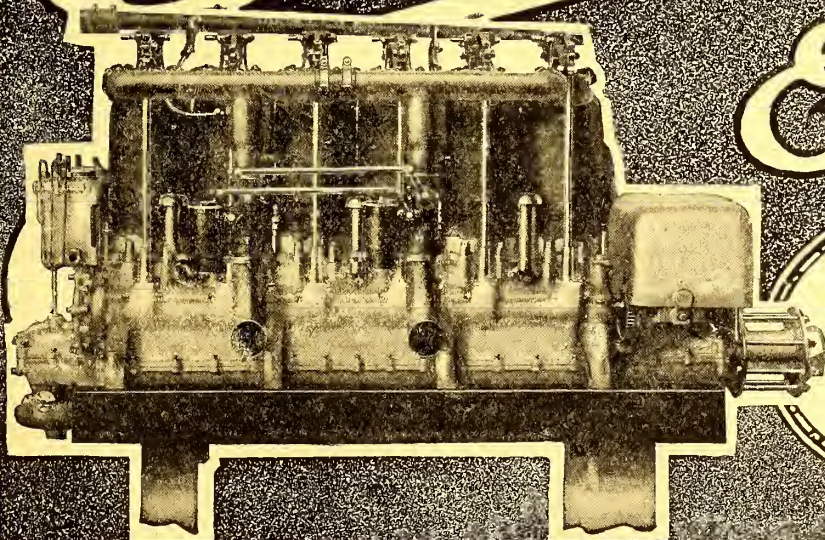


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THE PATENTS INDEX.

The subjoined list of recent inventions has been specially compiled by THE AEROPLANE from the current Official Patents Records.

PATENT APPLICATIONS.

- Aeronautical Instrument Co. Apparatus for producing a suction or pressure effect. No. 8397. June 12th.
- Bengtsson, V. Gun-firing mechanism for aerial machines. No. 8358. June 11th.
- Brown, E. O. Aircraft. No. 8554. June 14th.
- Calthrop, E. R. Parachutes. No. 8408. June 12th.
- Calthrop, E. R. Parachute launching devices. No. 8409. June 12th.
- Calthrop, E. R. Safety spring slings for parachutes, etc. No. 8410. June 12th.
- Calthrop, E. R. Parachutes. No. 8411. June 12th.
- Craven, P. P. Propelling mechanism for flying machines. No. 8302. June 11th.
- Goatly, F., and another. Aircraft. No. 8548. June 14th.
- Gray, P. W. Optical sighting devices for aircraft, etc. No. 8309. June 11th.
- Hamilton, B. T. Mounting and sighting apparatus for aircraft and anti-aircraft guns. No. 8489. June 13th.
- Hervieu, G. Sheds for airships, aeroplanes, etc. No. 8386. June 12th.
- Jonckheere, A. Aeroplanes, airships, etc. No. 8596. June 15th.
- Maison Breguet. Chronotelemetrical apparatus for regulating firing of anti-aircraft guns. No. 8698. June 16th.
- Maison Breguet. Chronotelemetrical apparatus for regulating firing of anti-aircraft guns. No. 8699. June 16th.
- Maison Breguet. Chronotelemetrical apparatus for regulating firing of anti-aircraft guns. No. 8700. June 16th.
- Marsden, F. W. Instrument for indicating inclination of aircraft. No. 8607. June 15th.
- Western Electric Co. Telephone systems for aeroplanes. No. 8482. June 13th.
- Miller, A. R. Level-indicator for aeroplanes, etc. No. 8591. June 15th.
- Pashley, A. H. D., and another. Aircraft. No. 8396. June 12th.
- Peczenik, C. E. Aeroplane engines. No. 8501. June 14th.
- Robson, J. Aeroplanes. No. 8640. June 15th.
- Scanes, A. E. L. Instruments for indicating position of aircraft. No. 8626. June 15th.
- Tellier et Cie, A. Hydroplanes. No. 8479. June 13th.
- Valda, J. H. Life-saving parachute appliance for aircraft. No. 8326. June 11th.
- COMPLETE SPECIFICATIONS ACCEPTED, PRINTS OF WHICH ARE OBTAINABLE ON AND AFTER JULY 5TH, 1917.
- 106,640. May 10th, 1916. Koressios, T. N. C. Air supply for carburettors of flying machine motors.
- 106,888. July 6th, 1916. Porter, J. R. Aeronautical machines.
- 106,944. Nov. 27th, 1916. Bradshaw, G. E. Propellers of aeroplanes, hydroaeroplanes, airships, or the like.

ABRIDGMENTS OF RECENTLY PUBLISHED SPECIFICATIONS.

- 105,581. Aeronautics; Aerial Warfare. LANDOR, A. H. S., 10, Via Farini, Florence, Italy.

AERIAL MACHINES WITH AEROSTATS; AEROSTATS; CARS AND CABINS.—A rigid airship, of the type having the framework in the form of a deep girder and fitted with gas-containers arranged with their axes vertical, is constructed with a streamline contour having a maximum depth and width towards the bow and tapering to a point at the bow and also tapering slightly towards the stern. The gas-containers are provided with means for reducing their volumes at the lower ends when a reduction in the volume of gas occurs, the use of ballonets being thus obviated. Figs. 3 and 4 show one form of framework, *a*, *b*, *c* composed of tubes or rods of steel, aluminium, wood, or bamboo braced, for examples, by wires *d*. One or more rows of cylindrical gas-containers *e* are arranged in the framework as shown in Figs. 1 and 2. The cylinders may vary in diameter as shown, or the number of rows of cylinders may vary throughout the airship. Prisms of hexagonal or octagonal section may be used instead of cylinders, and intermediate spaces may be filled in by smaller cylinders *e*¹ or triangular or octagonal prisms. An envelope of fabric, celluloid, mica, thin metal, etc., is provided. The lower ends of the gas-containers may be reduced in volume either by hand or automatically by means of rods *r*, Fig. 5, arranged to nip the cylinders at the desired height. The gondola *l* may be built in the lower part *a* of the framework, and a passageway may be provided along the whole length of the ship in the part *a*. An aft observation platform *i* may carry a searchlight.

PROPELLING.—Pairs of propellers *n* are carried at opposite sides of the ship in such a way that each propeller is farther

from the ship than the preceding propeller. Additional propellers may be provided, one at the front end of the gondola, and the other *n*¹ near the rear end of the ship.

STEERING.—Rudders *f*, *g* are provided at the front and rear ends of the ship, the forward rudder *f* consisting of two planes on a common pivot and fixed at a definite angle to one another. The rudder *g* may be warped in addition to the pivotal movement. Front and rear elevators *h*, *k* and intermediate elevators *j* are provided also.

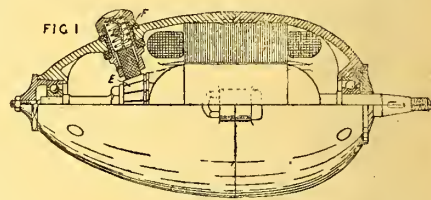
PLANES, ARRANGEMENT OF.—Stationary fins *q* may be provided above, below, and at the sides of the airship.

LANDING.—Floats *x* may be provided under or along the gondola *l*, under the gun platforms *o*, and along the lower portion of the airship.

AERIAL WARFARE.—A gun is mounted at the front end of the gondola *l*, and an aft observation platform *i* carries a gun *3*. Guns *p* are mounted also on platforms *o* which may be extended from the sides of the airship so that the guns can be fired at objects vertically above the airship. Fig. 8 shows platforms *o* arranged to be swung out about pivots; or the platforms may be collapsible in lazy-tongs fashion.

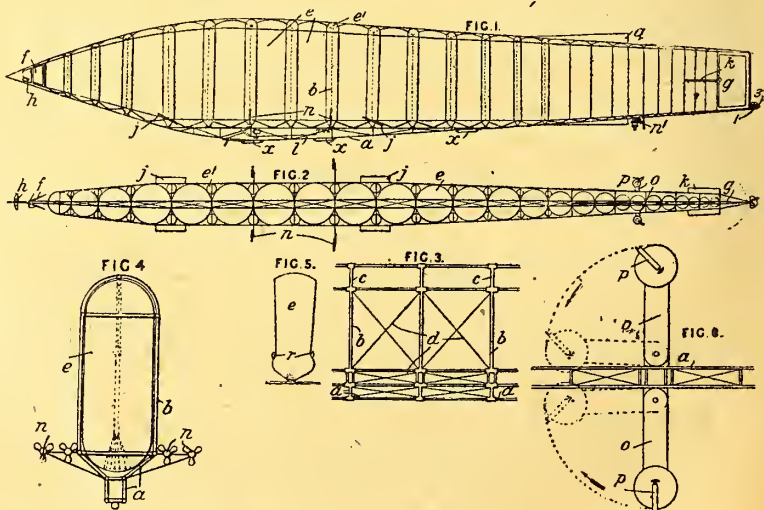
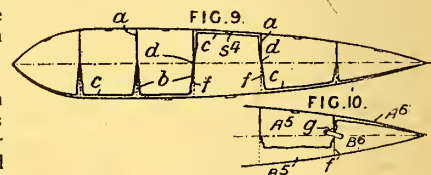
- 105,634. Dynamo-electric Generators for Aircraft. MORTLEY, G. E., 23, Forest Road, Tunbridge Wells.

CASINGS.—The casing of a dynamo-electric generator for use on an aeroplane or airship is constructed with an ovoid or streamline form so as to reduce air eddies to a minimum. The casing is preferably in two halves joined on a plane at right-angles to the armature axis by lugs or bolts by which it may also be secured to the fuselage of the aeroplane. The commutator *E* is of conical form and the brush-holder *F* is set at an angle to the armature axis. Openings are provided at each end of the casing to allow air currents to pass through, the armature and field magnet laminations being formed with ventilating passages. The generator may be driven directly by an air-screw or other source of power, or a governor may be interposed between the generator and air-screw in order to maintain the generator output constant. The front end of the casing proper may be truncated, in which case a nose piece surrounding the governor and revolving with either the air-screw or the spindle is employed to complete the streamline form. The armature or the casing may be driven by the airscrew.



- 105,588. Aeronautics. KAPFERER, H., 13, Rue Couchot, and SOC. ANON. ASTRA, 121, Rue de Bellevue, both in Billancourt, Seine, France.

AEROSTATS. — In dirigible balloons having a number of cells separated by transverse diaphragms, each diaphragm comprises an upper impermeable part



a and a lower permeable part *f*, the upper part being continued downwards and sub-divided into two flexible partitions *b* con-

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 1780 CHISWICK (3 lines).

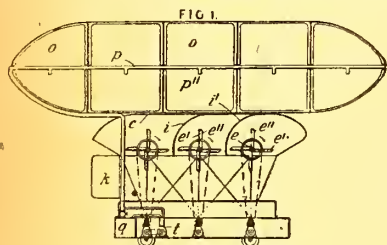
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nected to adjacent parts of contiguous partitions as shown, to form an inner partition *c*. This partition *c* is adapted to contact either with the lower or upper wall of the envelope according as the gas cell is filled or empty, and is connected at the sides to the envelope at opposite ends of a diameter *d*. The part *f* is formed by netting or light fabric and assists in tensioning the whole of the diaphragm *a*. Each cell, having a valve *s*⁴, can be independently inflated or deflated. In the construction shown in Fig. 10, the end compartment B⁶ is separated from the compartment B⁵ by an impermeable diaphragm *f* whereby, should the cell A⁶ be pierced, the gas from the cell A⁵ can be forced into the chamber B⁶ through the tube *g*. This arrangement provides for the supporting of the rear planes even when the balloon is pierced.

105,667. Aircraft. BESTON, G., 124, Tachbrook Street, Pimlico, London.

An aircraft having a car preferably adapted for use on water and with wheels for running on land is provided with a series of



the fans force air. The lower part of the fans project below the canopy and the fan blades in the lower portion of their paths produce a backward stream of air stated to assist the rotation of the fans to the rear and also act on the vertical rudder *k*. When an aerostat is employed, it is mounted above the canopy and is divided up into chambers, each containing a ballonet *o* and having an axial pipe *p* with openings *p*¹¹ into each ballonet. The pipe *p* is connected to a pressure reservoir *q* and to a pump *t* so that the ballonets can be inflated or deflated as desired. Air also may be admitted to the spaces surrounding the ballonets. The roof of the gondola is arched to let the air from the canopy readily pass away.

MARKET REPORTS.

Prices are for quantities on usual terms.

June 21st, 1917.

COPPER.—There is still no radical change to report. Supplies are very regular and quite satisfactory. Furthermore, the output of Copper is increasing. Of course, the demand for U.S.A. war requirements will be very large; in view of this, there may be an effort to increase prices.

Current Prices.

Copper Ingot (Standard) Cash.....	£130 per ton.
Copper Sheet	£165 per ton
Copper Tube S.D.	20½d. per lb.
Brass Sheet, 24G.	16½d. per lb.
Brass Tube S.D.	17d. per lb.

TIN.—The market still appears to be in a very erratic condition, prices having again advanced. A pretty fair business is being done even at the advanced prices. It must be observed that with the recent advance the price of £255 ruling at the beginning of the month has not yet been reached.

Current Prices.

To-day (21st inst.)	£249
Last week	236
Last month	250
Last year	178

LEAD.—The position is still very complicated and serious, supplies being most difficult to obtain even for urgent war work. The state of affairs in Spain is at a deadlock, and there does not appear to be any immediate prospect of receiving supplies from that country.

The official prices remain unaltered.

Official price£29 10s. to £30 10s.

STEEL.—There is still a very abnormal demand for all classes of Steel, finished, semi-finished and special Steels.

Aircraft Steels are now under the control of the Air Board, the output of the various mills being distributed by them. It remains to be seen whether this will improve the situation or not.

There is a slight indication that prices will again advance.

Current Average Prices.

R.A.F. 3A Steel, 38s. to 40s. per cwt. Basis.
R.A.F. 1E Steel, 78s. to 80s. per cwt. Basis.
R.A.F. 9A Steel, 32s. to 33s. per cwt. Basis.

ALUMINIUM.—There is no alteration in the general situation.

Current Official Prices.

Ingot	£225 per ton.
Remelted	£210 per ton.

TIMBER.—There is no improvement whatever in the general outlook. It is generally agreed that there is a bad time ahead, particularly for the consumer. We are rapidly approaching a state of prolonged famine for Walnut and Mahogany.

The entry of U.S.A. into the war has increased the difficulties which were already crippling the timber merchant, and this particularly applies to Silver Spruce. Prices are still very high, and there is very little hope of a reduction.

Current Prices.

Silver Spruce, 17s., c.f.
English Ash, 13s. 6d. to 14s. 6d., c.f.
Walnut, 2s. 5d., s.f.
Mahogany, 2s. 2d. to 2s. 4d.

FABRIC.—The authorities still withhold their official notification of the prices for 17C Cloth, and it remains to be seen whether the control of this material will be an improvement on the pre-controlled period.

The price, 31d. per yard, given in last week's report for spaced Fabric should have been 17C Cloth, 38 in. wide.

Official Prices (Reported).

17C Cloth, 36 in. wide, 29½d. per yard.
17C Cloth, 38 in. wide, 31d. per yard.

FOR METAL PARTS.

Aircraft manufacturers in search of metal parts on the workmanship of which they can absolutely rely are recommended to investigate the abilities of Arnott and Harrison, Ltd., of Hythe Road, Willesden, N.W.10., to satisfy their needs.

Mr. Arnott and Mr. Harrison form a very happy combination indeed, in that one is an exceedingly clever engineer, and the other a very sound business man, who at the same time possesses considerable mechanical knowledge. And in Mr. Wright the firm has a mechanical engineer of experience and ability in handling men. Thus one is assured of getting the proper material, properly made, and handled in a properly businesslike manner.

Mr. Arnott has invented several machines for the production of certain aircraft parts which are so difficult to make that several firms have given up the job in disgust. It may not be advisable to give full details of these machines, which the writer had the pleasure of examining during a recent visit to these works, but it suffices to say that they both increase output and do the work more accurately than has hitherto been possible.

In going through the various shops, one is struck by the appearance of order and system which pervades the place. The workers evidently take a keen interest in their work, and are on the best possible terms with the foremen and with the proprietors of the firm, and when one perceives this happy state of affairs one is assured that the men at the top know their jobs, and have thus won the confidence of those under them.

Despite "combing-out" and the difficulties of running a rapidly increasing business with an influx of raw hands, the partners have kept the quality of their work at a very high level, with the result that they are entrusted by some of the leading aircraft firms with the making of special parts requiring the greatest accuracy in machining and fitting. No better testimonial can be desired as to the firm's ability to tackle any metal work which is required.

The shops are excellently equipped with machinery and tools, and though already working at high pressure, there is always room for further expansion, so that there need be no hesitation about placing orders with the firm.

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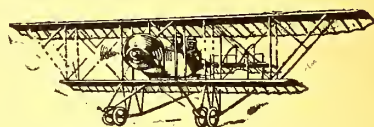
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(Continued from page 1660B.)

younger son of the late Charles Henry Vane-Tempest and Florence Mary, his wife, now Mrs. Nigel Harrison, of Wellington House, Norton, Stockton-on-Tees, was reported "missing" on March 25th last. He was born on May 5th, 1896, and educated at the Rev. Herbert Bull's, Westgate-on-Sea, and at Eton. He played for the school at Lord's against Harrow in 1914 and made 37 runs. Instead of returning to Eton, although only just 18, he joined his local Territorial battalion of the Durham Light Infantry. Being unable to go to the front when they went, on account of his age, he joined the Royal Flying Corps in Oct., 1916, and speedily became a most proficient officer, obtaining his wings in Jan., 1917. On Feb. 7th, 1917, he went to the front, and on May 30th news reached his family that he had died of wounds at Ligny, in a German camp, a few hours after being taken prisoner.

A correspondent of the "Times" writes:—"All who knew him admired his firm, straight, and strong character and his perfect sincerity. He was the most adored of sons, and his place in his family will be difficult to fill. His predominate qualities were great courage and intense gratitude to anyone who had ever helped him by love or advice."

WILLIAMS.—Sec. Lt. Roland Vaughan Williams, R.F.C., who was accidentally killed while flying in France on June 5th, was the eldest son of Mr. and Mrs. A. H. Williams, of St. Mereyn, Flodden Road, Camberwell, S.E., and was in his 19th year. He was educated at St. Paul's School, and was articled to his father, a solicitor of Camberwell. He joined the Artists' Rifles in Sept., 1915. A year later he transferred to the R.F.C. He was killed within a week of proceeding to the front.

ENGAGEMENTS.

BOURNE—BAYLOR.—An engagement is announced between Lieut. Geoffrey Campbell Bourne, London Regt., attd. R.F.C., younger son of the Rev. C. W. and Mrs. Bourne, of Staplehurst Rectory, Kent, and Eileen Mary, younger daughter of Dr. and Mrs. Edward A. C. Baylor, of North Lodge, Ipswich.

FULLER—FULTON.—The marriage arranged between Capt. C. Drury Fuller, Royal Sussex Regt. and R.F.C., and Miss Beatrice Fulton, daughter of Sir Robert and Lady Fulton, 7, Sloane Gardens, will take place on July 2nd at Holy Trinity Church, Sloane Street.

GOULD—MOCKRIDGE.—The engagement is announced of Capt. R. G. Gould, M.C., R.F.C., eldest son of Mr. Robert Gould, Pincroft, Pyrford, Surrey, to Margaret, second daughter of Mr. Whitney Mockridge, Pine Lodge, West Byfleet, Surrey.

LANGLEY—LUDGE.—The engagement is announced between Sec. Lt. Robert Langley, R.F.C., eldest son of the Rev. John Langley, rector of North Wraxall, and Mrs. Langley, and Lorna, third daughter of Sir Oliver and Lady Lodge.

MACRAE—BAILLIE.—The marriage arranged between Mr. Duncan MacRae, Seaforth Highlanders (attached R.F.C.), and the Hon. Maud Baillie will take place to-day at 2.30, at St. George's, Hanover Square. The reception will be held afterwards at Chesterfield House, kindly lent by the Duke and Duchess of Roxburghe.

MURRAY—WOODRUFF.—An engagement is announced between Major E. M. Murray, M.C., Q.V.O. Corps of Guides, attached R.F.C., eldest son of Colonel R. D. Murray, I.M.S. (retired), Nevern Square, S.W., and Gwladys Vivienne, only daughter of Mr. Henry H. Woodruff and Mrs. Woodruff, of Barnsley and Harrogate.

POTTS—THORNDIKE.—The marriage between William Janson Potts, Lt., R.A.F., attached R.F.C., only surviving son of the late William Potts and of Mrs. Potts, of Sanderstead Hill, and Gladys Isabelle, only child of the late Major F. H. Thorndike, Royal Sussex Regt., and of Mrs. Thorndike, of Backheath, will take place quietly at St. Peter's Church, Eltham Road, Lee, S.E., at 2 on Saturday, July 14th. Friends will be welcome at the church.

STEEL—CHALMERS.—The marriage arranged between Sec. Lt. Graham Strange Steel, R.F.C., only son of the late Thomas Steel, and Marion Chalmers, only daughter of the Rev. James Henderson, will take place very quietly at Portsmouth on Thursday, June 28th.

MARRIAGES.

BAINES—ALLATINI.—On June 14th, at St. George's, Hanover Square, Capt. Mathew Talbot Baines, R.F.C., elder son of Mr. and Mrs. M. T. Baines, of Buckhill House, Calne, Wilts, was married to Flora, younger daughter of Mr. and Mrs. R. Allatini, of 18, Holland Park, W., by the Rev. Hyla Holden, Rector of Upminster, uncle of the bridegroom, assisted by the Rev. W. Mackean, Vicar of St. John's, Ladbroke Grove, W.

DE COURCY—WRIGHT.—On June 21st, by special licence, at Holy Trinity, Sloane Street, Capt. John Arthur Gerald de Courcy, M.C., R.F.C., only son of the Hon. C. R. S. and Mrs. de Courcy, and grandson of the late Lord Kingsale, was married to Anna Felicia, youngest daughter of the late Hon. Mr. Justice Wright and Mrs. Wright, of Ryecroft, Bray, Co. Wicklow, and

granddaughter of the late Sir Croker Barrington, Bart., of Glenstal, Co. Limerick.

MURLIS-GREEN—GODWIN.—On June 17th, at St. Mary's, Wandsworth, Capt. G. W. Murlis-Green, D.S.O., M.C., R.F.C., of Beckenham, was married to Eva, daughter of Mr. A. Godwin, of Wandsworth Common, by the Rev. S. G. Compton, M.A.

[Capt. Murlis-Green will be remembered as the gallant young officer who won the D.S.O., the Military Cross—with bar—the Legion of Honour, and the Servian White Eagle all in three months this year for exceptional services in the Balkans. All will wish him and his bride every happiness.]

BIRTH.

TEMPERLEY.—On the 22nd inst., at Lincoln, the wife of Clifford James Temperley, Northern Cyclists' Battalion, attached R.F.C., of a daughter.

The "Times" special correspondent at British Headquarters in France writing on June 7th of the Wytschaete-Messines action says:—

Simultaneously with the merciless pounding of our guns and the unceasing raiding by the infantry, our aviators have waged a fierce and brilliantly successful war on the enemy machines, so that, on the front of this one Army, General Plumer's Army, our aviators between June 1st and June 6th crashed 24 enemy machines and drove down 23 out of control, losing in all the fighting only 10 machines themselves.

Among the squadrons included in this area is that of which I recently told the extraordinary tale of how five of our machines fought 27 Germans, wrecking eight of them and themselves all getting home safely. The whole record of our Air Service during these last few weeks has been extraordinarily fine.

* * *

Reuter's Special Service stated in the "Morning Post" of June 23rd that, among the letters found in German dugouts, many references continue to be found to the daring and efficiency of our flying corps and the comparative ineffectiveness of the German air service. Whatever may be the actual facts with regard to this, the German infantry appears to have made up its mind that it does not get satisfactory support or protection from its fliers, and that it suffers much from the skill and enterprise of our own. There are even sneers at the raiding of open towns being safer work than flying over the British Army.

* * *

The King and Queen have telegraphed to Alderman Ball, Nottingham, that "they have learnt with deep regret of the death of your son, Capt. Ball, whose conspicuous and consistent bravery won him the Victoria Cross, D.S.O., and the M.C. They deplore the loss of so gallant and distinguished an officer, and truly sympathise with you in your sorrow."

* * *

One gathers that an obituary notice which appeared in THE AEROPLANE of June 13th, relating to the death of an officer named Sec. Lt. Higgs, R.F.C., who was killed in an accident near Northampton on June 9th, has caused anxiety to certain friends of Lt. G. W. Higgs, R.F.C., of Canada. Unfortunately, it was impossible to procure the initials of the officer who was killed, and, consequently, some misapprehension may have been caused. Mr. G. W. Higgs is alive and well.

* * *

Mr. Hugh Barrie, M.P. for North Derry, has received news from the Geneva Red Cross that his son, Sec. Lt. Frank Barrie, R.F.C., reported "missing," is a prisoner of war at Karlsruhe.

Lt. O. Berry, King's Own Scottish Borderers, attd. R.F.C., who has been missing since April 8th last, is 24 years of age and is the son of Mr. and Mrs. Berry, of 17, Argyle Road, Southport. He was educated at Beckerton House, Birkdale, Southport, and joined the School Corps in September, 1914, and obtained his Commission six months later. After serving in Gallipoli and Egypt, he transferred to the Royal Flying Corps.

Lt. D. C. Birch, Northamptonshire Regt., attd. R.F.C., is the son of Mr. and Mrs. Birch, Ham House, Eastrey, Kent. He passed out of Sandhurst, August, 1916. He was reported missing on April 6th, but it has since been ascertained that he is a prisoner in Germany.

Lt. N. A. Birks, R.F.C., who has been missing since April 5th, is the son of Mr. and Mrs. Birks, Colman Gardens, Woodseats, Sheffield, and is 24 years of age. He received his Commission soon after the outbreak of war, and was previously a member of the O.T.C., attached to the Sheffield University.

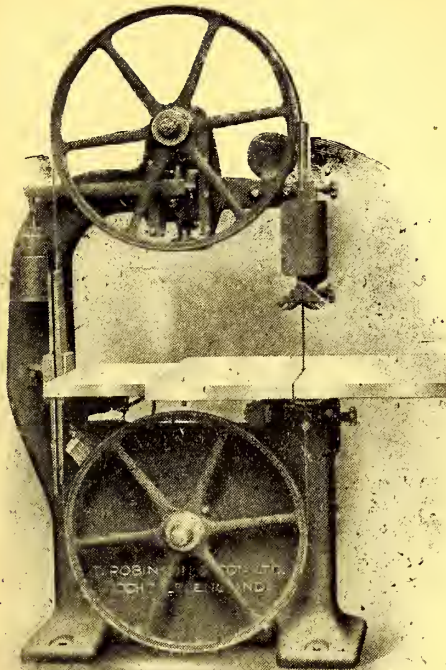
Lt. A. Boldison, Lincolnshire Regt. and R.F.C., who has been missing since April 5th, is the son of Mr. and Mrs. Boldison, of 2, Roundhay Grove, Leeds, and was a valued member of the staff of the "Yorkshire Post." In July, 1915, he joined the University of Leeds O.T.C., and was granted his Commission in May, 1916. He is 20 years of age.

Lt. G. Jacob, R.F.C., of 73, Mayes Road, Wood Green, N., is in hospital in London, with his left arm shattered. He was

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wounded while flying over the enemy, but his machine came down in the British lines. He was educated at the Southgate County School, where he was for some time head boy. On leaving school he joined the R.F.C. Cadet Wing, and received his commission during 1916.

Lt. A. R. M. Rickards, R.F.C., who is missing, is the son of Mr. and Mrs. Rickards, of Daubeny House, Fairfield, and joined the Inns of Court O.T.C. On obtaining his Commission, he joined the R.F.C. After winning his wings he became a ferry-pilot and took part in the great bombing raid on Good Friday last, when he failed to return. It has since been ascertained that Mr. Rickards is wounded and a prisoner.

* * *

SEC. LIEUT. FREDERICK CYRIL HOEY, R.F.C.—Notice is hereby given that all creditors and other persons having any claims or demands against the estate of the above-mentioned Officer, are required to send the particulars in writing of their claims or demands, to The President, Committee of Adjustment, on or before July 3rd, 1917, after which date none will be entertained.—Write Box D.428, the "Times," London, E.C.4.

FRANCE.

OFFICIAL COMMUNIQUÉS.

JUNE 20th.—ARMY OF THE ORIENT.—There has been activity on the part of the British Air Service, which successfully bombarded the enemy encampments in the Struma valley and to the north of Petrich.

JUNE 21st.—Fourteen aeroplanes and one German captive balloon were destroyed on our front during the period June 8th-20th. Eleven of these machines were brought down by our pilots in air fights, and three were brought down by the fire of our machine and anti-aircraft guns.

Seven other enemy machines were seriously hit and fell in their own lines.

During the same period our air squadrons carried out numerous raids and bombarded, notably, the railway station of Bensdorf (south-east of Metz), the factories of Hayange, Joeuf, and Moyeuvre (in the Briey area), the blast furnaces of Burbach and of the Sarre Valley, the railway stations of Béthényville, Chatelet-sur-Returnne, Rethel, Mezières, and Charleville (on the Reims-Namur Railway), Molsheim (south-west of Strassburg), bivouacs in the valley of the Suppe, ammunition dumps in the region of Laon, etc. Thirteen thousand kilogrammes (13 tons) of bombs were dropped during these expeditions, which inflicted important damage on the enemy's establishments.

ARMY OF THE ORIENT.—British aviators bombarded the enemy camps and stores of Bogdanci (between Lake Doiran and the Vardar) and at Vetrina, on the Struma, causing considerable damage.

JUNE 25th.—Three aeroplanes and three captive balloons belonging to the enemy were shot down yesterday.

* * *

An official statement to the Press was issued in Paris on June 13th on the subject of military aviation. It says that Germany intends to be able to put into the fighting line by the spring of 1918 a total of 3,500 aeroplanes, which is a considerable number, it being remembered that to keep machines in flying order a fresh supply of 50 per cent. per month for chaser aeroplanes and 30 per cent. per month for other aeroplanes must be allowed for. The statement, speaking of the French effort, says that it is considerable and cheering, and that it will be powerfully supported by the co-operation of the Americans.—It adds:—

Helped by America we shall maintain our mastery of the air. The assistance asked of the United States includes from the point of view of *personnel* the dispatch of a first contingent of American pilots, who will complete their training at French flying schools, and the despatch, already carried out, of a contingent of French instructors to the United States. America will provide equally powerful support from the point of view of material. The programme worked out and decided upon by the Flying Corps is being developed methodically, and is of a nature to inspire us with the strongest confidence and the best expectations.

* * *

A report from Paris states that the Aviation Group of the Senate, which recently paid a visit to the British Aviation School, commemorated the visit on June 21st by giving a reception at the Senate to British, Italian, and French aviation officers. Admiral Lacaze presided at the reception, and among others present were M. René Besnard, Under Secretary for War; M. Daniel Vincent, Under Secretary for Aviation; M. Antonin Dubost, Baron d'Estournelles de Constant, M. Deutsche de la Meurthe, M. Girod, Mr. Grahame, the British Chargé d'Affaires in Paris; Lord Murray, Wing Comdr. Briggs, Director of the British Aviation School; Col. Mitchell, Director of the American Aviation School in France; and Capt. Beltramo, of the Italian Air Service.

Baron d'Estournelles de Constant welcomed the Allied aviators, and Admiral Lacaze associated the French Navy with the recep-

tion. Afterwards, M. Daniel Vincent paid a tribute to the great work of the British aviators and said that the spirit and discipline which animated it might be taken as a model.

Wing Comdr. Briggs remarked that Great Britain would build more and more machines in order to destroy more and more German machines. Col. Mitchell said that, without specifying the exact extent of the work of the American aviators, he could give an assurance that it would continue to be as great as it was persevering. Capt. Beltramo associated Italy with the sentiments uttered by the preceding speakers.

* * *

It is reported that Capt. Guynemer has been promoted to Officer of the Legion of Honour. In the Army Orders appointing him he is praised not merely for the large number of his victories and for the example he shows daily by his flights, but also for the skill and certainty of his methods that have made him a conspicuously dangerous enemy to the Germans. Capt. Guynemer has now brought down 45 enemy aeroplanes, has been mentioned on twenty occasions in Army Orders, and has been twice wounded.

* * *

It is reported that during the week ending June 16th, Sergt. Lufbery, of the American Lafayette flying squadron in France, brought down his 10th victim.

The French Aeronautic League have awarded its silver plaque to Messrs. Thaw, Lufbery, Johnson, Haviland, Lovall, and Wyllis.

GERMANY.

OFFICIAL COMMUNIQUÉS.

JUNE 21st.—FRONT OF GERMAN CROWN PRINCE.—At Vauxaillon, north-east of Soissons. The break into the enemy line, well supported by tried shock-troops, artillery, and aviators, took the enemy completely by surprise.

JUNE 23rd.—Since June 15th, 23 enemy aeroplanes have been brought down in aerial battles and five by our defensive firing from the earth. Four captive balloons of the enemy have also been brought down.

JUNE 24th.—In the Wytschaete Bend three captive balloons were shot down by us. The enemy also lost three aeroplanes.

* * *

It is reported from Holland that Capt. Brandenburg, who conducted the air raid on London on June 13th, has received the Order Pour le Mérite.

* * *

The "Leipziger Neueste Nachrichten" of June 22nd, deplores the death of Captain-Lieutenant Franz Georg Eichler, commanding L48, destroyed on June 16th-17th during the air attack over the south of England. Captain Viktor Schütze who, as previously reported, also perished on this occasion, was the leader of the airship squadron of which the L48 was the flagship. Captain-Lieutenant Eichler, who was 40 years old, after serving in the Navy, entered the service of the Hanburg-Amerika Line, was promoted Captain-Lieutenant of that line, and was captain of the "Imperator" and the "Vaterland." He entered the officers' corps of the battleship "König Albert" as artillery officer on the outbreak of war. In May last year he entered the Naval Airship Service, and had participated in a large number of attacks on England.

* * *

Commenting on the demand voiced in Great Britain for reprisals for the air raids on London, the "Düsseldorfer General Anzeiger" said on June 19th: "The English forget that we can get to London much more quickly than they can get to Cologne, and also that we should reply with double force to every such reprisal."

* * *

The Berlin "Lokalanzeiger" reports that Admiral von Köster, president of the German Navy League, made his first flight on June 24th, flying very high over Wilhelmshaven with three other naval aviators. He is 73 years of age, and after the flight there was a banquet in his honour, at which he urged that Germany should have a much stronger fleet.

* * *

It was reported, on pure hearsay, from Amsterdam on June 9th that the Kaiser and Marshal von Hindenburg were at Ghent on May 28th during the air attack on St. Pieter's station. A squadron of aviators appeared above the city and bomb explosions were soon heard. The Kaiser, the Marshal, and a number of high officers were in one of the waiting rooms. Bombs fell on the station premises and in the neighbouring streets. Some soldiers standing on guard before the train were wounded, and five others, not 200 yards from the station, were killed. Other soldiers were wounded by a bomb which fell near the Leopold Barracks. The Kaiser and the Marshal and the Staff were, however, uninjured.

In a simultaneous attack on St. Denis Westrem two aviators and three guards were alleged to have been killed and two sheds destroyed, and there were many wounded. Panic prevailed at Ghent.

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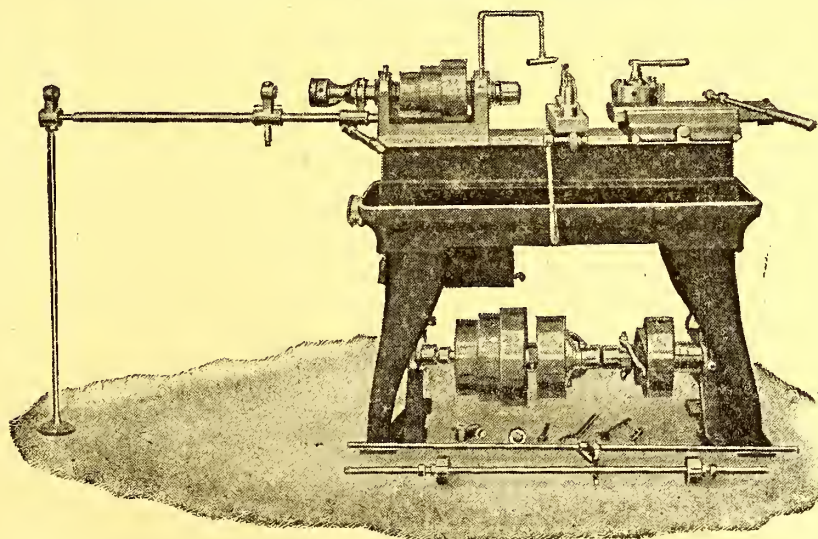
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This is the second occasion, so far as is alleged, that the Kaiser has been involved in air raids in Flanders. The first was at Thielt on November 1st, 1914.

Another report from the frontier says that during the recent air attack which destroyed a large gasholder at Ghent 14 Germans were killed and over 20 wounded.

* * *

It was reported from Amsterdam on June 11th that Lieut. Josef Schaumburg, the first German aviator to use aeroplanes in battle, and also the first aviator to drop bombs from aeroplanes, was shot down during the battle of Messines by a British aviator. He fell dead in the German lines.

Just what is meant by "the first to use aeroplanes in battle" is not very clear.

RUSSIA.

OFFICIAL COMMUNIQUÉS.

JUNE 19th.—On the European front there has been air activity.

THE BALTIC.—On June 15th, five enemy seaplanes made two raids on our naval base in the Gulf of Riga, endeavouring to drop bombs on our artillery sheds and on the vessels in the roadstead. The bombs did not attain their objectives, and only one sailor was wounded by splinters from a bomb. The attacks of these machines were repulsed by energetic fire from our warships and land batteries.

Despite numerous daily attacks by enemy aeroplanes and the hundreds of bombs which they have dropped, thanks to the brilliant activity of the gunners on our warships and our naval batteries, the enemy has not hitherto achieved any results.

JUNE 20th.—Aerial activities have taken place on the European and Caucasian fronts.

JUNE 21st.—Aerial operations have taken place on the European front.

Second Captain Kozakov brought down a German aeroplane, which fell in the region of Podhajce. The occupants, an officer and a soldier, were wounded and taken prisoners.

JUNE 22nd.—There were aerial operations on the European front.

On his return from an aerial engagement, Capt. Kruten, one of our most gallant pilots, fell, and was killed while descending at an aerodrome. During the course of numerous aerial fights with Austro-German aviators, Capt. Kruten brought down six aeroplanes, all of which fell on our territory.

JUNE 22nd.—On the Baltic Sea on June 22nd six enemy seaplanes carried out two raids at the southern extremity of the island of Oesel (north of the Gulf of Riga), dropping 33 bombs on ships lying in the roadstead and on the shore batteries, but causing no loss or damage. The attacks were repelled by the fire of our Fleet and sea batteries.

ITALY.

OFFICIAL COMMUNIQUÉS.

JUNE 20th.—Numerous air squadrons supported the artillery, dropping a large quantity of bombs in the immediate rear of the enemy lines. All the machines returned safely.

JUNE 24th.—In an air fight an enemy aeroplane was forced to land in its own lines near Mt. Armentera (Val Sugana)

* * *

An Italian semi-official statement says:—

JUNE 21st.—During the recent offensive in the Trentino, over 145 aeroplanes, of which 61 were chasing machines, took part in the aerial operations against the enemy's base and lines of communication and the plateau. These threw some 400 aerial torpedoes to the weight of some 5½ tons. The fire of the enemy's anti-aircraft guns slightly damaged two of our machines. All the others returned undamaged.

* * *

Admiral Corsi, the Minister of Marine, visited the Caproni works at — early in the week, and had a longish flight on one of the triplanes turned out by the firm, piloted by Pensuti, and accompanied by two officers of his Staff. Admiral Corsi was able to get a first-hand idea of the triplane, as also of a very new "chaser," which escorted him, with the intention of displaying to the full the airmanship of the pilot and the airworthiness of the machine, which is described as combining, to the extreme, speed and stability, and is Italian to the marrow, or, perhaps, one should write, "to the glue."

* * *

The Prime Minister, who has also been visiting at Turin, had a flight, so that aviation can scarcely be said to have been given the sad eye in this land.

My mention of the new offensive tactics in a letter sent you on May 10th is curiously borne out by the communiqués, official and semi-official, of the 24th. They also rub in my remarks in THE AEROPLANE of May 9th, as to the large number of aeroplanes (and pilots, of course) available. Even thus the Army can spare that very able pilot, Lt. Mario de Bernardi, from active service, in which he has been engaged with special honour for some long time, in order to carry out postal experiments between Turin and Rome.

The time employed each way was about 4 hours, the machine, a Pomilio F.I.A.T., 200-h.p. biplane, and the daily papers got to Rome 8 hours earlier than by train. This, in spite of a late start, I understand. Collecting nets, to avoid landing mishaps, will have to be used it seems if the aeropost is to be run economically. I enclose the 2½d. stamp. issued for the experiment.

* * *

Wonderful things in the land, or rather the sea, of the Bossi firm may be heard some fine day. "Flying torpedo-boats with giant motors," on dit.

* * *

I hear that the big British biplane which arrived in this country a few days back, with several people on board, had a great send-off from Rome. The whole affair has greatly struck the public mind and has been more effective than any amount of paper propaganda. The mention of sleeping berths and Bagdad (with I don't know how much truth) appealed to the man of the streets as nothing has since the "tanks" cropped up.

Even by the indirect Lyon-Fréjus and Pisa route which the biplane took, the London-Rome railway record has had to take quite a back place. About 18 hours was all the time the London aero 'bus seems to have taken between the Hub of the Universe and the Eternal City.

* * *

The Aero Show, held at Milan during the latter half of June, was as interesting as any held before, in spite of its being a good year late, for reticence sake.

Nearly two score of motors—half of which were Austrian—stimulated thought. Their value is estimated at half a million francs. Several Warchalowski, one Hiero (of the same breed), and an Hispano-Suiza, just not to mention anything Italian, of which there was so much that was admirable, will receive attention in my full report. The Hun machines showed little that was of interest, except the absence of copper and metal in general.

The progress made by the Italian trade is, though quite expected, most striking, and in most cases evolutionary.

Naturally, things centre round the Caproni giants. A wing of the triplane divides up lengthways 40 yards of corridor very effectively, the entering edge resting on the floor. These machines are merely enlarged 300-h.p.s., with an added lowest plane among the chassis, and another 350-h.p., and everything *en suite*. The central nacelle is shown complete with 8-cylinder vertical I.F. fitted, so big as to unbalance one at first sight. After quite a walk one comes to a place where normally a tail should be, only to find the beginning of a motor!

One is struck with the prevalence of the vertical motor here, as elsewhere. Several varieties of this type are mounted on planes, and I note that the I.F. (Isotta-Fraschini) is far the most numerous, followed by F.I.A.T. I am only mentioning what the eye sees. Several of the big car firms seem to be building the former.



A Piece of the Chain-Shot used by the Austrians in their Anti-Aircraft Shrapnel.



The First Official Aerial Post Stamp. A reproduction of the Stamp used on letters sent by the Italian Official Experimental Aerial Post from Milan to Rome.

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The "Savoia," with its various activities, is, of course, to the front. A fine boat body, exquisitely complete, is especially notable.

The S.A.M.L. turned up its sleeves when Italy needed help, and deserves, therefore, of the Allies. The company builds aviatics and makes magnetos.—T. S. H.

INDIA.

SIMLA, JUNE 24th.—It is officially announced that successful operations have been carried out by the Waziristan Field Force against the Mahsuds.

Aeroplanes and bombs played an important part in the fighting. Our troops, who were assisted by a Nepalese contingent, returned to camp after inflicting severe lessons on the enemy.

Our casualties were light, but included Major Harte, of the 6th Gurkhas, killed.

BULGARIA.

OFFICIAL COMMUNIQUÉ.

JUNE 22nd.—MACEDONIAN FRONT.—Aerial activity is reported from the whole front. Two enemy aeroplanes were brought down in the Monastir region after a fight in the air.

BELGIUM.

OFFICIAL COMMUNIQUÉ.

JUNE 24th.—Our aviators brought down an enemy machine, which fell between Zande and Zevecote.

DENMARK.

Lt. Hammeler, leader of the Danish Military Aviation School, fell with his machine near Copenhagen on June 22nd, and was instantly killed.

SWEDEN.

It is reported that export of parts of flying machines and airships, and balloons and parts thereof, from Sweden is prohibited.

U.S.A.

It is reported that the Aircraft Board has planned the construction of 2,000 aeroplanes per month. The parts have been standardised, and the automobile and typewriter factories have been asked to assist in their construction.

* * *

It was reported from Washington on June 18th that Admiral Peary, in giving evidence before the Senate Military Committee in support of the Bill establishing a Bureau of Aeronautics, urged that the national aim of the United States should be to become the first Air Power of the world.

"Why not," he said, "take the initiative, instead of being pushed into every move for national preparedness, as has been the case during the last two years?"

* * *

The Navy Department announces that a hundred aviators, who have been undergoing training, will be sent to France. These men are qualified pilots, but they will need further instruction before they are competent to be placed in charge of machines on the battle front.

* * *

It is reported from Washington, D.C., that the United States Government has adopted as the distinguishing insignia for all United States aircraft a white five-pointed star with a red centre on a circular background of blue.

All American aeroplanes, seaplanes, captive balloons, and airships will bear the star of the Flying Corps, which combines the red, white and blue of the national flag.

* * *

It was reported from New York on June 14th that Capt. Bonnell, an American flying officer, who is credited with having killed Capt. Boelcke, the crack German aviator, has assumed charge of recruiting for the British Aviation Service. It is stated that 843 men were enlisted in the first week.

HOLLAND.

The "Echo Belge" (June 3rd) learns from the frontier that in the course of the Allied air attack on Thursday and Friday the gasworks and sawmill at Rabot and the aerodrome at St. Denis were bombed. Sixty-five bombs fell on the aerodrome, causing great damage, while one of the big gas reservoirs blew up.

A Zeppelin was seen in Holland on June 1st, apparently following the railway line from Hoogezard to Groningen. The frontier guard at Bellingwolden fired 70 shots at it.

* * *

The German naval aviator who landed in Holland on May 29th has been interned. He bears the Italian name of Carlo Rapazzi.

The "Telegraaf" (Amsterdam, May 30th) learns from the frontier that a heavy bombing attack occurred at Ghent on Whit Monday, occasioning a regular panic. Explosions began even before the alarm signals were sounded.

The Allied air squadron appeared above St. Pierre Station, the junction of the Bruges, Dixmude, Courtrai, Oudenarde lines, which was the aviators' objective. The station was hit and injured.

AIRCRAFT IN THE HOUSE.

On June 20th the Chancellor of the Exchequer (Mr. Bonar Law) informed Colonel Weigall (Horncastle, U.), that the Government were not prepared to consider the advisability of placing German prisoners of war in the unfortified towns in the Isle of Thanet, on the ground that British prisoners were now in Karlsruhe and Freiburg.

The Chancellor of the Exchequer, replying to Colonel Claude Lowther (Cumberland, Eskdale, U.), who asked whether, in view of the increase in air raids, the Government would immediately appoint a committee to consider the question of reprisals, said:—The answer is in the negative. I can add nothing to what I said in the House on Monday as to the steps which the Government are taking to deal with the situation.

* * *

On June 21st the Chancellor of the Exchequer (Mr. Bonar Law), replying to Captain Burgoyne (Kensington, N., U.), who asked when it was proposed to announce the appointment of the successor to Lord Northcliffe in the chairmanship of the Civil Aerial Committee, said:—An announcement will be made at an early date.

The Chancellor of the Exchequer, replying to questions by Mr. Peto (Devizes, U.) about the decision of the Government as to retaliation for the air raid on London, said it was not possible for him to say more on this subject than he said on Monday last. It was a question of what the Government did more than what they said.

Mr. Bonar Law, in reply to Mr. Bennett-Goldney (Canterbury, U.), said it was not possible to adopt his suggestion that a small committee should be appointed to examine the latest methods of defence now adopted in France, and in our own country, against enemy aircraft, more especially in and around Paris and London and our coast towns.

The Chancellor of the Exchequer, replying to Colonel C. Lowther (Cumberland, Eskdale, U.), who suggested that if British officers had been sent to Karlsruhe, reciprocal treatment should be meted out to German prisoners in this country, said:—It has been formally stated by the German Government that the internment of Allied officers in the prisoners' camp at Karlsruhe has no connection with the policy of reprisals.

* * *

On June 25th Mr. Bonar Law, replying to Mr. Brookes (U, Mile End), and Commander Wedgwood (U, Maidstone), said he had nothing to add to the statement he had already made as to the adoption of a policy of reprisals in connection with enemy air raids.

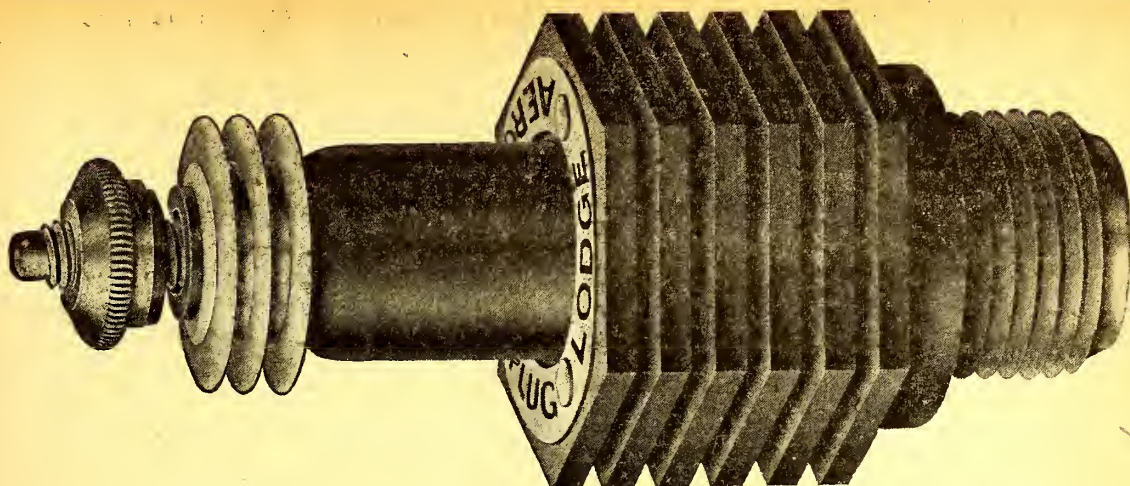
Mr. Billing (Ind, Herts, East): Has the right hon. gentleman received resolutions in favour of reprisals from meetings held in different parts of the country, and has any notice been taken of them?

Mr. Bonar Law: They have been received, I have no doubt, and probably they have been read.

Colonel C. Lowther (U, Eskdale): Is no importance whatever to be attached to the opinion of the people of the country?

Mr. Bonar Law: I am well aware of all my hon. friend has said. I have already said that the Government, after consultation with the military authorities here and the Commander-in-Chief in France, are using the air forces in the way they think best not only against the enemy but in order to prevent these air raids. That must be an executive action. (Cheers.) I do not think the House will press me to say more.

Mr. H. A. Fisher (President of the Board of Education), replying to Sir H. Craik (U., Glasgow and Aberdeen Universities), said he had visited the school which was struck during the recent air raid, and was informed that the casualties on each floor of the building were as follows: Second floor (girls' department), 1 killed, 3 injured; first floor (boys' department), 1 killed and 15 injured; ground floor (infants' department), 16 killed and 27 injured. He was glad to say that in the majority of cases the injuries were only slight. One of the assistant masters in the boys' school promptly sent half a dozen scouts to obtain assistance at the police and fire stations, in accordance with arrangements made in case of an attack of fire. In response to this appeal assistance in the shape of police, nurses, soldiers, and ambulance men was forthcoming within from five to ten minutes of the explosion. In the meantime most valuable help had been given by Mr. W. Crooks, the hon. member for Woolwich, and others who happened to be on the spot at the time of the explosion. There was no doubt that the assistance given was both immediate and adequate. Within twenty minutes of the explosion all the injured children, with the possible exception of one girl on the top floor, were carried out, and the bad cases were on their way to the hospital. The behaviour of the children and the teachers was admirable, and there was no panic. The question as to what further precautions should be taken in the schools against air raids was receiving his careful attention, and he was obtaining expert advice in the matter.



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The World's Air Routes and their Regulation.

By COL. LORD MONTAGU of BEAULIEU, C.I.S., F.R.Met.Soc., A.I.M.E.

Advising Mechanical Inspector to the Government of India.

On June 20th Lord Montagu of Beaulieu delivered to a large and distinguished audience his promised lecture on the World's Air Routes. The chair was taken by Lord Sydenham, of Combe. Lord Montagu said:—

Though the time has not yet come when regular postal and commercial communication by means of the air is established, there are many signs that after the war an effort will be made by all civilised nations to develop this aspect of flying, as foreshadowed by Mr. Holt Thomas in his recent lecture. It follows, therefore, that already there is need for consideration of the problems of how official, private and commercial flying must be regulated in a national and international sense. Moreover, it is important that the principles governing the regulation of such traffic should be agreed upon and established before the traffic itself actually comes into existence, when awkward precedents may have arisen leading to unsound ideas being adopted, which should be arised in the interests of efficiency and order.

INTERNATIONAL AND NATIONAL LEGISLATION.

There has, so far, been no international conference to deal with the problems which concern world flying, but it may be mentioned that in 1899 it was agreed at that now discredited body, the Hague Convention, that no bombs or explosive missiles might be dropped from aircraft. A year or two later, however, Germany and France signified that they could no longer adhere to this undertaking, though Great Britain still remained bound, not having signified dissent. Now the bombardment by aircraft of points of naval and military importance, and of undefended towns as well, has become a matter of daily occurrence, and the resolution of the Hague Convention remains an interesting relic of the past, and the moral it conveys is plain. This is not the place to discuss how far the dropping of bombs by aeroplanes upon towns, whether of military, partly military, or non-military character, will influence the course of war; but without going deeply into this interesting phase of the subject, I may assert that if all an enemy's country is to be considered liable to attack from the air, the cherished privileges hitherto granted to the non-combatant population are at an end. In future, civilians, whether men, women, or children, will be subjected to a considerable and increasing proportion of the risks formerly borne by the soldier alone. As a matter of fact, this is no new development in one sense, for a besieged city shelled by the long-range guns of the enemy has never had such immunity. The bomb-carrying aeroplane, being for this purpose a long-range gun, is merely following the example of its more or less stationary predecessor on the ground, with a much more limited range.

The International Aeronautical Conference which sat at Nancy in 1899 decided that only warfare could reveal the abuses to which the aeroplane could be put. This conclusion was prophetic and eminently true; there have been plenty of such revelations lately.

As regards national legislation on the subject, Parliament passed a law, which came into operation in 1913, prohibiting flying over certain areas of naval and military importance, and stipulating that foreign pilots alighting in this country from abroad should descend in certain specified areas, after giving 18 hours' notice in advance to the Home Office of their intended flight. Germans of late have had the hardihood to ignore this statute.

So far as international law is at present concerned, there can be no private or national rights in the air over the sea beyond the 3-mile limit. Over the land, by the law of England, it is held that private property extends *usque ad cælum*—that is, the possession of a piece of land carries with it rights to the sky above the same area. National air rights, therefore, presumably extend all over the land of any nation, and in the case of countries with a seaboard, there must be added the fringe of the 3-mile limit round the coast.

THE POSITION OF THE BRITISH EMPIRE.

The British Empire is in a peculiarly favourable position for the development of Imperial aviation, for our widely separated possessions will enable our air traffic round the world, over land and sea, to proceed without having to ask for concessions from other nations. The very scattered nature of the Empire in this matter is an advantage, and the central European Powers will lose presently the advantages of their compactness. The importance of harbours and coaling stations under the British flag all over the world in the past to our naval forces and to our mercantile marine has been very great. But in future still more important will be a chain of landing places for both land and sea planes, and, for the latter, sheltered harbours will be

as necessary and valuable for the development of our air services by sea as flat alighting grounds on the land for land machines.

When the map of the world is studied, it is interesting to observe that with a few exceptions our possessions are conveniently situated for flying. There is a chain of Imperial landing places southward and eastward from Gibraltar, about 900 miles from London as the plane flies, towards the Cape, to Egypt, India, and the Australasian Dominions. The nearest points between the North American Continent and Europe, the West Coast of Ireland and the East Coast of Newfoundland, are also both within the Empire.

ROUTES AND WINDS.

For some time to come flying will be more easy over the land than over the sea, owing to the existence of well-organised landing places at every ten, fifteen or twenty miles. Over the sea flying must be more difficult and dangerous to start with until the absolutely reliable engine is available and the movement of storms and the circulation of winds have been studied and their behaviour can be forecasted accurately. In any case, I think it is unlikely that straight-line routes between place and place will be those that will ordinarily be adopted. In the air the currents of wind are not only far swifter than in the case of those of the sea, but so swift that an adverse wind beyond a certain point will reduce any but the fastest aeroplanes to the position of not being able to achieve any useful speed over the surface of the globe. I assume in saying this that the average speed of commercial flying will probably not exceed much over 80 miles an hour for some time to come. It will never pay to fly for money-earning purposes a mile an hour faster or a foot higher in altitude than can be proved to be financially worth while. Wind currents will therefore be of supreme importance to air transport companies. As 40 to 50 mile winds are not uncommon in the upper air in the temperate zones, while 30-mile winds are still more frequent, it follows that it may pay to go many miles out of the direct route, geographically speaking, to secure favourable currents. It is an interesting fact, therefore, that in many cases we know already of the existence of well-defined and persistent air currents which will be of great assistance to world navigation. Another way of emphasising this point is to realise that a continuous 3-mile current in the open sea is uncommon, most regular ocean currents not exceeding more than one half this speed. Even a 3-mile current would only make a difference to a ship of 72 miles in 24 hours. Yet most courses for ships are laid out to avoid or to use such currents. In the case of flying, even a favourable 30-mile wind would add 720 miles to the day's run, while a head wind of a like speed would take 720 miles off the distance covered. In other words, there would be 1,440 miles difference in every 24 hours between a 30-mile wind favourable to the course of the aeroplane and a 30-mile wind against it—a difference so great as to make longer mileage a matter of comparison indifference. What this may mean I have only to state that it is about 1,800 miles from a point in County Kerry in Ireland to St. John's, Newfoundland. Assuming that an aeroplane started from St. John's with a 30-mile westerly wind behind it, and was capable itself of a speed of 80 miles per hour, the combined speed of 110 miles an hour over the surface of the globe would mean that in about 16½ hours after leaving St. John's the seaplane or aeroplane could alight on the coast of Ireland. With a contrary wind of 30 miles per hour the speed of the seaplane would be reduced to 50 miles per hour over the earth's surface, and the journey would take 36 hours instead of 16½, or nearly 20 hours longer.

Already there exist machines which, by substituting a load of petrol for a load of bombs, could remain in the air over 16 hours, so I am not putting forward an impossible example.

It may be advisable, therefore, in some states of the atmosphere to fly to the North American continent via Iceland and Greenland; in other states of the atmosphere via France, Spain, Portugal, and the Azores. The reasons for these circuitous routes will be seen in some diagrams which I shall show you. It is clear, therefore, that meteorology and the study of wind currents is going to be of supreme importance. The knowledge of the world's atmospheric conditions and accurate forecasts, apart from their inherent scientific interest, may affect the saving or spending of millions of money annually, when postal and commercial aviation is established.

THE ORGANISATION OF ROUTES.

It is probable that the first great world routes to be regularly organised will be those over land, for reasons which I have

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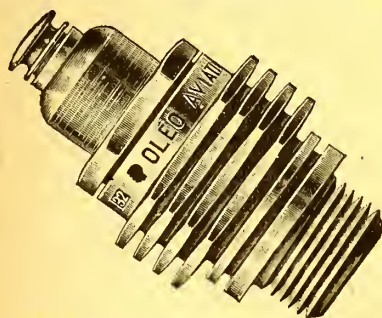
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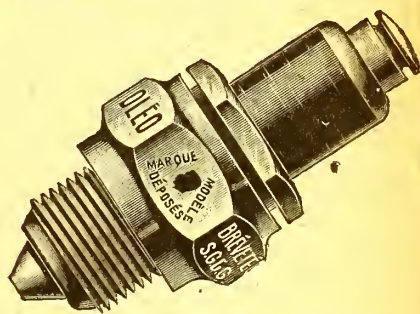
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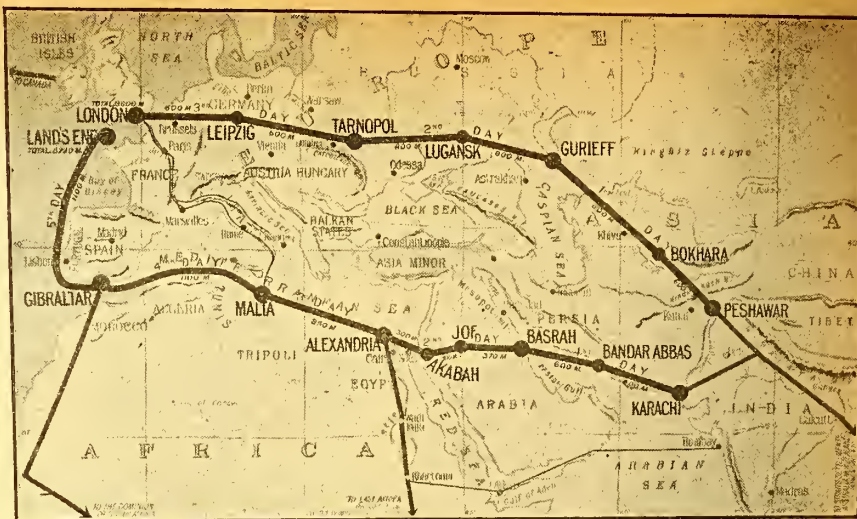
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already mentioned. And it should be remembered that the longer the distance, the more remarkable the saving in time. For instance, you will see on this map two alternative routes to India, and beyond India to Australia and China. Before the war 14 to 15 days was the fastest average time by railway and mailboat to India, and about 30 days to Australia. You will also observe that I have indicated one route which will lead via our Western African Colonies to the Cape, and another which, following the Nile, would lead to the Sudan, British East Africa, Rhodesia, and Natal. In the Northern, or land, route to and from the East I have assumed that some international arrangement will be come to by which the air above a certain level will be internationalised, following the well-established parallel of the 3-mile limit round the coast. On this route you will see that five independent countries are involved besides British territory—Afghanistan, Russia, Austria-Hungary, Germany, and Holland. The distance from London to Peshawar by this route is about 3,600 miles, and from Australia about 7,000 miles. The other Eastern route, which for purposes of identification I call the All Red Route, passes wholly over the sea and over the land of the British Empire and the 3-mile sea fringe round it. It might, however, be convenient to arrange landing places with our Allies France and Portugal for the route to Gibraltar, and with France and Italy in regard to more distant landing places in Algeria, Tunis, and Tripoli. The route to the East by sea via Gibraltar is 1,600 miles longer than that which takes the more northerly course, being about 5,200 miles as against 3,600 miles. I do not believe continuous flying by night and day will be popular or practical for many years to come, so I allow in all my calculations for passenger services for two periods of flying every day of 600 miles each, or 10 hours in all, which, at 120 miles an hour, would give the reasonable distance of 1,200 miles covered between dawn and sunset. I think a rest by night will be more popular than a continuance of the journey in the dark. Then, as now, the wonderful views of the earth beneath will be one of the greatest inducements to fly by day. Mails, on the other hand, will probably proceed continuously, but except in the most urgent cases passengers will, I think, be content to travel in the immensely shortened time which will be occupied, say, in getting from London to India or Australia or South Africa. The saving would amount in the case of India to at least 11 days and in the case of Australia 23 or 24 days. As the world becomes more luxurious again, there will be few, apart from enthusiasts, who will care to face the discomforts of eating, drinking, sleeping, and performing other necessities of civilised human life in what must necessarily be a cramped space.

I am of opinion also that the pilots will have regularly defined stages like engine drivers on locomotives have their definite stages on long distance journeys. For instance, the train taking you to Edinburgh or Glasgow from London is ordinarily drawn by one locomotive from London to Crewe, by the second from Crewe to Carlisle, and by the third from Carlisle to Edinburgh or Glasgow, the distance of 400 miles being thus broken up into three stages. Similarly, the average pilot will be unable to remain entirely alert and efficient after the strain of, say, six hours hard flying even if he has an assistant. In addition, to know the peculiar weather conditions of any 600-mile stage across the planet's surface, the local liabilities to storms and the prevailing air currents at different times of the year will need special study in each section. I assume, therefore, that world flying, as far as passenger services are concerned, will be arranged by stages and not be continuous. There are, of course, some overseas routes on which no intermediate stops will be possible, except in fine weather or in conjunction with areas of the ocean artificially protected and made suitable for landing by oil, baulks of timber, or grass mats on a large scale to abate and subdue heavy and breaking waves. By the Southern Atlantic route to North America the 1,200 miles of the first stage to the Azores, via Portugal, will be covered comfortably in one day under ordinary circumstances, and rest secured that night, while from there the second day's flight on to St. John's, Newfoundland, will form another quite possible daylight stage. The meteorological importance of the Azores will be referred to later.

In the case of postal communication, the cases containing mail matter will no doubt be made trans-shipable, or rather trans-planable, to save time and trouble in transferring them at the beginning and end of stages.

Assuming, therefore, the stage-by-stage system, I set out here a time-table of the two routes to India and beyond from Peshawar and Karachi respectively to London.



Two Routes from India. One across Germany, the other the "All-Red" Route, entirely over British Possessions, with continuations to West Africa, East Africa, and the Cape.

I.—SOUTHERN ROUTE TO INDIA.
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Miles		Time.
—	Croydon (London)	dep. 7 a.m.
625	Marseilles	arr. 12.30 noon
485	Naples	dep. 1.30 p.m.
		arr. 6 p.m.

SECOND DAY.

—	Naples	dep. 7 a.m.
640	West Coast of Crete	arr. 12.15 noon
485	Alexandria	dep. 1.15 p.m.
		arr. 5.45 p.m.

THIRD DAY.

—	Alexandria	dep. 7 a.m.
580	Jof	arr. 12 noon
460	Basra	dep. 1 p.m.
		arr. 5 p.m.

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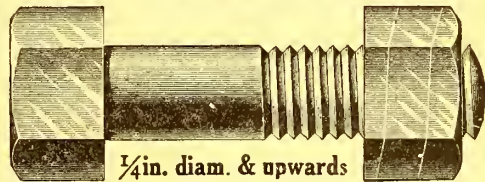
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575	Bandar Abbas	arr.	12 noon.
680	Karachi	dep.	1 p.m.
		arr.	6.30 p.m.
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39 hours 15 minutes actual flying time.

83 hours 30 minutes total time on journey.

II.—NORTHERN ROUTE FROM INDIA.

FIRST DAY.

—	Peshawar	dep.	7 a.m.
600	Bokhara	arr.	12 noon.
620	Gurieff (Caspian Sea)	dep.	1 p.m.
		arr.	6.15 p.m.
1,220			

SECOND DAY.

—	Gurieff	dep.	7 a.m.
600	Lugansk	arr.	12 noon.
610	Tarnople	dep.	1 p.m.
		arr.	6 p.m.
1,210			

THIRD DAY.

—	Tarnople	dep.	7 a.m.
600	Leipzig	arr.	12 noon.
600	Hendon (London)	dep.	1 p.m.
		arr.	6 p.m.
1,200			

Total distance, 3,630 miles.

30 hours 15 minutes actual flying time.

59 hours total time on journey.

SEPARATION OF TRAFFIC IN "LEVELS."

Now we come to the point at which we must inquire how flying round the world is to be regulated; how the principal lines of traffic are to be defined; the methods of constructing the principal aerodromes, which I will call "dromes" for short; the landing places for safety purposes. In considering these problems, it must be remembered that we have the third dimensions to help us, that is, height and depth as well as length and breadth. Air traffic will present features similar to those on both land and sea in addition to marked new possibilities peculiar to the air.

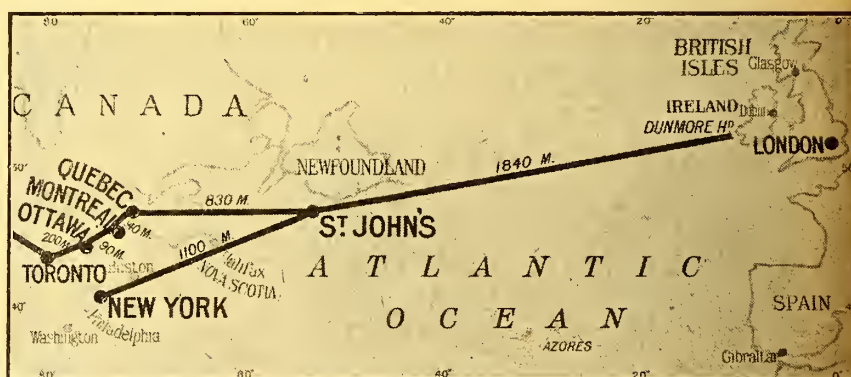
The great principle which I think should underlie all regulation of air traffic is, that slow speed planes should use the lower levels and high speed planes the upper levels of the air. You will see on this diagram five levels, stretching from the earth's surface up to 10,000 ft., through which I suggest the various kinds of traffic should be classified to pass. The first 2,000 ft. from the surface of the ground upwards should be prohibited to air traffic in general, but be usable, of course, by the private owner of the soil if he desires, and for the purposes of descending to his own landing or to "dromes" or intermediate safety landing places. This must be so, for aeroplanes will probably form one of the commonest forms of locomotion in a few years' time, and provision must be made for all traffic to land at intervals of, say, 10 or 15 miles on defined routes.

In admitting the claims that any air should be private, I conform, to some extent, to the present law of *usque ad cælum*, but I propose to limit that right to an altitude of 2,000 ft. Owners of houses and land, and the dwellers upon and in them, have a moral and probably a valid legal claim to be secured some privacy from nuisance arising from air-traffic. Apart from noise, there may be the danger of voluntary or involuntary descents. When flying becomes general everywhere, without some such regulation no privacy will exist for anyone except in lonely lands or dense forests.

Above this private level we come to the commercial levels, which I propose shall range from 2,000 feet to 4,000 feet. I place this class of traffic on the lowest of the flying levels, on account of the fact that commerce will want to operate as cheaply as possible, and to achieve height and speed means extra expenditure of motor spirit, which ever way it is looked at. And I would make this 2,000 to 4,000 feet level usable by silenced planes only with a maximum speed of 80 miles per hour.

Above these commercial levels I propose another zone of 2,000 feet, 4,000 feet to 6,000 feet for planes, also silenced, capable of speeds between 80 and 120 miles per hour. This will include the general air traffic of the planet for ordinary flying, including a proportion of fast commercial flying. As all aeroplanes will shortly be fitted with superchargers, or their engines designed and built for high altitudes, high flying will become quite easy. At present the decreasing density of the air at heights, leading to falling off in engine power, is a disadvantage. This will shortly be neutralised so that the engine produces the same or even greater power at a height than at the earth's surface. There is, of course, a height where human health and comfort will be affected owing to the effects on the blood of decreased atmospheric pressure, such as what is called "fizzing," and the chance of faintness and heart attacks when a rapid descent takes place. The intense cold also at high altitudes will tend to keep passenger traffic, as a rule, in the lower levels, for there is a decrease of about 5 degrees Fahr. for every 1,000 feet of height. Above 6,000 feet to 10,000 feet I would reserve the levels for the official planes of each nation. These levels would be used by its naval, military, and civil forces, and by police planes, for air police will be needed in the same way that policing of routes by land and sea is now necessary. Specially authorised pilots, and perhaps postal services, will also use the 6,000 to the 10,000 feet levels, where the international levels will begin. I would remark here that unless we are to have lawlessness and anarchy in the regions of the air, there must be efficient control—this is an axiom of efficiency and civilisation. Control of the levels can only be exercised, nationally and internationally, by police pilots on fast planes above the ordinary traffic, where, with the forces of gravity to aid, they can descend with a superior swiftness upon malefactors and breakers of the laws of the air, take their numbers or compel them to alight at the nearest landing place or drome. There must also be no unsilenced machines regularly operating below 8,000 feet—I am not sure whether that limit is high enough—for even above that height the noise of many open exhausts and the hum of many propellers may become a continuous and nerve-racking nuisance. A serious amount of unpopularity and agitation against the use of unsilenced planes will have to be faced before long. Those of us who remember the hostile agitations against the use of cars in the early days of motoring—against dust-raising, noise, and smell—are not disposed to treat lightly the possibilities of nuisances that must certainly arise from unsilenced aircraft.

Now we come to the levels above 10,000 feet, which I propose should be internationalised. The upper air should, I think, be free to all, under certain regulations, provided pilots comply with certain rules for meeting and overtaking, and their craft



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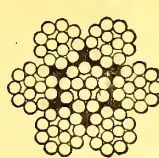
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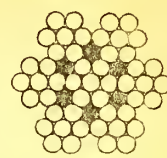
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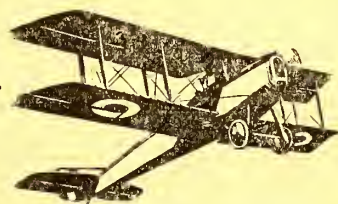


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passed as air-worthy—let us say, registered as A1 in a Lloyd's aerial register. This would follow the precedent, which has worked well, of the 3-mile limit at sea open to all ships of all nations. Great altitudes will impose upon ordinary flying some disadvantages which will tend to keep international flying overland and over-sea near the 10,000 feet limit, and flying at these levels will probably, so far as international flying is concerned, be conducted along routes to be defined by methods to which I will allude presently, and in some cases nations may agree to admit international traffic to its own levels. But if a particularly cantankerous nation objects to admit any traffic to the lower levels below 10,000 feet, the air routes will not be altogether barred. It is clear, also, that there will be prohibited areas, naval and military centres, and flying over thickly-populated districts will probably be avoided on account of a certain risk to those who are still content to crawl about on the earth. But, of course, this will not preclude, as I have said, the air liners of different countries using the lower levels when necessary under licence from the countries over which they pass. Then, postal and passenger services may sometimes be driven down to lower levels owing to stress of weather. Aircraft desiring to leave their own levels will, of course, use their wireless to ask for permission from national or international flying authorities. But in this case they should conform, at least so I think, to the rules for silence and any other restrictions which may be found necessary in the lower levels to ensure the peaceful enjoyment of the earth's surface by its inhabitants. The problem of how to secure law and order on oversea routes is more difficult, and for this purpose it seems to me that we shall have eventually to define the paths to be followed within, say, certain degrees of latitude and longitude. It is here again that international control will be necessary, and this control must be backed by international force in the shape of air police, for without force behind them conventions and international arrangements are as futile as the resolutions of the Hague Convention have proved to be. It may be, therefore, that flying over the sea outside the 3-mile limit will become a question of routes outward and homeward with no exactly defined air levels or a fewer number of levels, for there are no inhabitants to annoy over the wide spaces of the ocean, and no one to kill or annoy barring the very remote risk to those few human beings who will still be navigating the sea in ships, probably submersibles by then.

HOW ROUTES MAY BE DEFINED.

I now come to the question of how routes chosen over continents are to be defined and traffic guided by night and by day; also how landing places are to be constructed and defined. Here, again, I think we may follow the long and proved experience of the sea. It happens that we possess a more or less agreed code of buoys and marks for defining channels, which I suggest should be imitated in the matter of the air. On the right hand, or starboard, side of all routes from the West to East, the direction in which the earth turns, there should be round marks—a white ring containing a black centre. Routes emanating from westerly points would be those whose general trend is between north and south on the westerly side of the compass. To take, for example, the routes from America to Ireland, Great Britain to Russia or India, Japan to Alaska or British Columbia, Brazil to the West Coast of Africa—on these the starboard, or right-hand, marks on land and sea alike will be white circles with a black centre, while on the left, or port, side would be checker marks as shown here, square in shape. At sea a system of large buoys may be necessary, where the depth of the

sea is not too great for anchorages. And these marks, I may observe, will have to be of considerable size, probably at least 100 yards in diameter, for at 10,000 feet these will appear mere dots on the earth's surface. At night routes may be defined, as you see on these diagrams, by a continuous white light on the right, or starboard, side, and red and white alternating lights on the left, or port, side. These international and national routes, between countries, parts of a country, and continents should be of a minimum width of 5 miles, and in some cases a space of 10 miles may be a more suitable width when the air eventually becomes crowded. But that time is some way off. Dromes and landing places may have to be convex and circular, on the plan shown in the diagram. The advantage of this will be that every aeroplane alighting will have, running uphill, the force of gravity to arrest its motion, and when starting off again, the force of gravity will equally help to give it speed to rise from the ground. At night the principal light which will illuminate these special places will, of course, show it rays up wind, so that the pilot who is obliged to land against wind will have the light at his back and not at his face when making his landing. There must also be lights denoting the starboard and port sides, smaller green and red lights on each side of the portion of the ground on which landing is advisable. All these lights should be movable, and be placed on trucks on rails laid down round the circumference of the landing ground, so that they can be moved as the wind shifts from one quarter to another and in the day-time they can be used in conjunction with indication marks to achieve the same purpose. Let us take as an example the route from London to the north of England and Scotland. On account of the less windy character of the east as compared with the west coast, the route would probably follow to some extent the Great Northern Railway. It would divide somewhere on the borders of Durham, near Scotch Corner, whence the Glasgow route would take a north-westerly direction, over by Brough, Carlisle, and the Nith Valley, while that to Edinburgh would continue straight on by Newcastle, and thence either by Berwick under the lee of the Cheviots in the westerly winds which largely predominate in these latitudes or up Redesdale over the Carter Fell. These different routes would be indicated by large white arrows on the ground with, perhaps, the initial letter E or G to say in which direction the routes were proceeded. At night such arrows would be illuminated.

The marks and lighthouses could be at intervals of 10 miles alternately each side, or 20 miles apart on the same side, as shown on the diagram, and in the case of fogs these lighthouses will help, like those concerned in navigation by sea, with wireless telegraphy and toned fog horns. There will also be assistance given by at least two new and very recent developments of wireless telegraphy, by which direction of bodies in motion can be accurately ascertained by the helmsman or pilots and their position in regard to fixed points on sea, land, or in the air easily ascertained. I cannot at the present moment give any more precise indications at present of these new developments, which promise to be of the greatest assistance in the navigation of the air in the future. In fact, when perfected they will deprive night fog and cloud of most of their dangers. Over the sea lightships will be usable with the same code of lights always turned upwards. There may also be on land small captive balloons at moderate altitudes illuminated at night to indicate locality to the upper levels.

GRADIENT POINTERS.

Now we come to some minor, but still important, points, such



Lord Montagu's Suggestions as to Definition of Air Routes, described by him above and hereafter.



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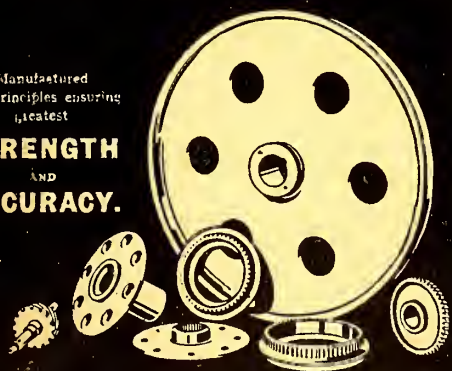
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as to how mountains are to be surmounted. You will remember that I expressly mentioned that the "levels" should be measured from the surface of the planet, not from sea-level calculations. It follows, therefore, that when you have to cross passes through mountains, such as the Himalayas, Alps, Pyrenees, or, to come nearer home, to fly over such mere pimples in comparison as the Pennine Range, the Cheviots, or the Grampians, there will have to be some signs to show that you are nearing "rocks." To indicate rises in the ground underneath, I suggest signs similar to those I show you in these diagrams. Of course, to save motor spirit (probably distilled by then from coal direct, and no longer petrol), the lowest passes through mountain chains will be selected. The world's traffic lanes will, therefore, not be at the same altitude all over the world reckoning from the sea level. They will vary except over flat countries. Let us take an instance near home, the nearest route from Newcastle to Edinburgh—over Carter Fell into Scotland—will necessitate a rise of just under 1,600 feet. Without proper warning, and on a misty day or dark night, an aeroplane flying to the east of the point where the border is crossed might collide with the Great Cheviot, which is nearly 3,000 feet high, or nearly touch Carter Fell itself to the west of the pass. There must be, therefore, indications of gradients similar to the gradient posts of railways. You will see in the diagrams how I propose that ascending and descending gradients should be made clear. These would be white patches by day and their outlines illuminated by night. Then you may legitimately ask at what level will your need for higher altitudes for your levels begin. I suggest that all altitudes from sea level to 250 feet should be considered as negligible. Above that, every 250 feet will be indicated by large figures giving the average altitude of the ground below, 500, 750, 1,000, and so on. It will be desirable in planning regular sea routes, to avoid isolated high hills or groups of hills small in area, such as Hindhead or the Malvern Hills. All routes will follow so far as possible flat country for meteorological reasons as well as I shall show presently.

HOW AIRCRAFT SHOULD BE MADE IDENTIFIABLE.

Now I come to the problem of how planes shall be designated and made identifiable. First of all, there will be the nationally-arranged colours of each country for those engaged in official services. Then I propose that all private planes shall be white, and commercial planes red to distinguish them the one from the other. All planes, official and private, will be lettered and numbered, as decided by some international conference, such as that which settled for all countries the regulations for international motor-car touring, which I attended on behalf of Great Britain some 10 years ago in Paris, and which allotted to each country specified lettering—GB standing for Great Britain, F for France, and D for Germany. Pilot certificates granted by responsible countries will be recognised as valid by all those countries which signify their adherence to an international agreement, in the same way as motor drivers' licences are now recognised everywhere.

WEATHER AND WIND ALL-IMPORTANT.

Almost the most important of the subjects which will have to be considered in relation to the world's air routes is how weather and wind conditions will affect flying over the surface of this planet. The prevalence of trade winds is known to you all, and how they blow with unvarying regularity and strength in certain directions in certain seasons. But what is less generally known is the almost permanent existence of areas of high barometrical pressure (sometimes called anti-cyclonic systems) in different parts of the world. These systems, though they contract and expand, have a more or less continuous effect upon the weather and winds of the world. I have not space to deal at length with this interesting subject, worthy of a separate lecture altogether, except as regards some special features over Europe, Western Asia and Northern Africa. Before these charts of pressure and winds can be properly understood, there are two points that must be grasped. Firstly, that wind always blows parallel to the lines of the isobars, that is, the lines of equal pressure; and, secondly, that the circulation of the wind is clock-wise in high-pressure or anti-cyclonic areas, and anti-clockwise in low-pressure or cyclonic areas. This is known as the Buys Ballot Law, which in the southern hemisphere equally applies in an opposite sense. Now you will observe that the weather of Western Europe, with which we are mostly concerned, is largely governed by two factors, the tendency to a low-pressure trough more or less, all the year round, between Greenland and Iceland, and the high-pressure area, which is permanent, though varying in area near the Azores. It is the combination of these two areas which produces the great preponderance of westerly and south-westerly winds over these islands and the Eastern Atlantic. There is another seasonal high-pressure area in the Sahara over North Africa, between the West Coast and the Sudan, during the winter time, as has just been proved by Major Lyons, the President of the Royal Meteorological Society, in a recent paper. Then there is a nearly constant area of high pressure north of the Himalayas, over Southern Siberia

and Turkestan. The low-pressure systems in the European and Western Asian areas are more seasonal and variable in character. There is a trough of low pressure, which lies between the Persian Gulf and the Western Himalayas, between May and October, which is the origin of the south-west monsoon so strongly felt in the Arabian Sea and over the western and northern parts of India. Then, nearer home, there is another area of low pressure generally prevalent over the Adriatic, the Northern Mediterranean and the Balkan States, which is characteristic rather of the winter than the summer months, producing a tendency to westerly winds in the Mediterranean and corresponding easterly winds to the northwards of the Carpathians. Now these systems and the consequent tendencies to a permanent direction of wind either all the year round or at certain well-defined seasons, have a most important bearing on the world's air routes. And the lesson to be drawn is, that instead of abusing the wind, we can use it. We can follow the main currents instead of fighting against them, and then we shall find them our friends. For instance, the route homewards from India during the greater part of the year will be far easier through Afghanistan, Russia, Germany, and by what I may call the northern route, than by a more southern course, for easterly winds or calms predominate. On the outward or eastward journey, however, the route is across France by the Rhone Valley, where the wind is often north-westerly, sometimes called the "Mistral," to Marseilles, whence we shall go either across the lower Alps to Italy, and follow the coast to the heel of Italy. Or we shall fly via Sardinia to Malta, whence by Tunis we get to Egypt. The alternative routes will be from Brindisi to Alexandria direct about 900 miles, or from Taranto to Malta. Thus the eastward and westward routes to India, the Central European and Mediterranean, may be spread apart by a thousand miles at their extreme point of divergence, and yet be the quickest routes and the cheapest to fly. In fact, wind will matter far more than mileage. In former days the trade winds dictated just the same sort of courses for sailing ships, and often the outward and homeward routes were half an ocean apart. So it will be in future.

EASTERN ROUTES AS AFFECTED BY WINDS.

Now let us take the outward Eastern route in detail and see how the winds will help on an average winter day. Starting, say, from Hendon, or, perhaps, from Croydon—for I assume that two great starting and landing places will exist for northern and southern routes to and from London—in the first flight Marseilles will be reached, where a descent for lunch will be made, the 600 miles—I give round figures—having been covered in about five to six hours. This portion of the route will be affected on about 80 per cent. of the days in the year, first by westerly and later by north-westerly winds, that is, either cross or negative and favourable currents. Next, some point near Taranto or Brindisi or at Malta itself will be the next stopping place. This part of the journey will probably be done by seaplane in order to avoid the longer route round the Bay of Genoa and the leg of Italy. The prevailing wind over this section will be north-west to start with, and afterwards light airs from the south-westward will be encountered. The "mistral" often extends in a modified form on many days in winter to a point as far as the south end of Sardinia, where the more westerly current supersedes it. The winds on the first day will, therefore, be favourable on the average. On the second day, whether we start from Brindisi for Alexandria direct or fly via Malta and Tunis or Tripoli, a westerly wind will prevail, as a rule, near the African coast, though a moderate easterly wind is sometimes met with in the neighbourhood of Malta from September to April.

On this second day's journey by evening you will have reached either some point between Malta and Alexandria on the Tripoli coast, or more likely Alexandria itself, only 850 miles from Malta. Egypt is situated in a region where calms or light winds predominate, with the exception of the disagreeable sand-laden "Khamseen," the strong westerly wind from the desert, which, however, is favourable to progress eastwards.

We then proceed eastwards over the Arabian desert, where calms and light winds are the rule, a state of atmosphere which prevails all the way to Karachi, except in the monsoon period, when the north-west wind is also in our favour. In the Persian Gulf the isobars for the greater part of the year show a prevalence of north-westerly currents, also favourable. At Karachi in the winter, during the day, wind of considerable strength from the south-west is produced by the great difference of temperature between the Arabian Sea and the heated areas of the Sind desert behind it. Flying on south-eastward towards Bombay or north-eastward towards Delhi, there is no decided unfavourable current on the average. Thus we trace step by step, or rather anti-cyclone by anti-cyclone, isobar by isobar, the outward route to India.

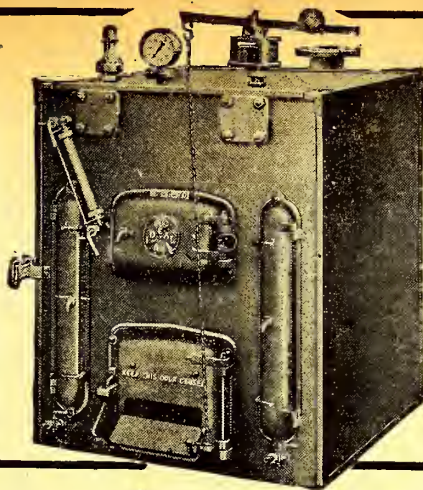
I have not time to examine in detail all possible routes, but on the homeward passage, the reverse side of these winds, favourable for flying eastward is available. Every weather system, as

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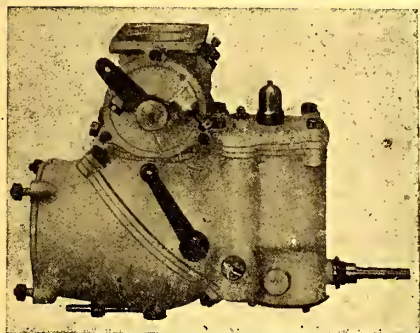
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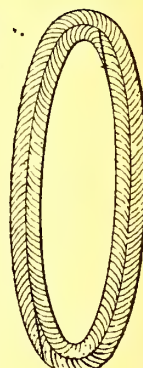
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I have explained, has a circular movement. There is no doubt about the prevalence of easterly and south-easterly winds throughout the monsoon period, lasting from the middle of May to the end of October, in all the country we should use for our westward journeys, through Afghanistan and through the neighbourhood of the Aral and Caspian Seas. Our first day's journey homeward takes us to Gurieff following the average isobars. And once the corner of the Hindu Kush has been crossed at about 5,800 feet, the country all the way to England is marvellously flat, which favours the absence of wind. I would remark here that absence of strong winds is a feature of inland flat countries, while mountain chains, especially when high and snow-covered, are specially liable to storms owing to the sharp changes of temperature producing local winds of considerable force.

The next day we leave the head of the Caspian Sea, and arrive via Lugansk at Tarnopol, near Lemberg. Here, again, we leave the mountain systems of the Caucasus, the Balkans, and the Carpathians to the south of our route. The next and third day we have to face the chances of westerly winds against us when approaching the North Sea and Channel, which, however, lose much of their force inland. From these, however, there will be no escape, except when an anti-cyclonic system exists over Scandinavia—a not uncommon winter and spring feature—which will give us easterly or north-easterly winds over Western Germany and Holland.

THE WIND OUR FRIEND.

After the detailed consideration of these two Eastern routes you will grasp the point at which I have been driving, namely, that the wind systems of the world can probably be made to serve the purposes of flying exceedingly well, and that instead of winds being a disadvantage to flying as might at first be thought, they will assist us if properly understood. In fact, the existence of alternate high and low-pressure areas, with their respective and regular circulations of wind, will define far more than geographical conditions the chief air routes of the world.

Of course, there will be special atmospheric conditions from time to time which will involve alteration from the average courses recommended for over-sea and over-continental flying. There may be, to take a common instance in summer, an extensive "low" over France or over the mouth of the Channel involving strong easterly winds blowing from our western shores far out into the Atlantic to a point at which the Azores "high" is joined up with another "high" near the Atlantic coast. In such a case a seaplane could, with the probability of a favourable wind over the greater part of the passage, fly from County Kerry to St. John's, Newfoundland, in a shorter time and with less expenditure of petrol than by any other route. And in flying westward you will be sun-chasing. In our English latitudes of 51 to 55 the earth's motion does not exceed about 650 miles an hour, and though we shall not be able to fly quite fast enough yet round the planet to keep the sun over our heads continuously, still at 120 miles an hour we shall lengthen our day very considerably. In the case of crossing the Atlantic there will be a gain of about four hours between Ireland and Newfoundland, which means that leaving Ireland at 7 a.m. on a summer morning, if an average of 110 miles an hour is maintained, you will reach St. John's in 16½ hours actual elapsed time, from which four hours must be deducted in point of solar time. Thus you will leave Ireland after breakfast at 7 a.m. and reach Newfoundland at 7.30 p.m. by local time, in time for dinner. Coming eastward, your daylight, alas! will be shortened by the same time, and, except in the summer months, a start before dawn or an arrival after sunset will be inevitable.

But to return to the consideration of a western route as affected by weather conditions. Assuming again an extensive "low" situated between the west coasts of Scotland and Iceland, a common winter type of weather, while the Azores "high" has extended some way up the Bay of Biscay, then the passage to America may be more advisable by the Azores than by any more northern route. With wireless stations specially instituted for this purpose over the world's surface, and ships stationed at intervals over the seas to send wireless messages as to weather conditions, our forecasts and weather charts of the future compared with those of to-day, good as they are, will be extraordinarily accurate, and be absolutely reliable except in the case of very suddenly formed small depressions local in their influence.

I would mention before I leave the subject of the winds, that along the line of the equator there is a tendency to an easterly wind, sometimes north-east, sometimes south-east, at all times of the year. This tendency also will be useful.

I cannot deal on the present occasion with other weather conditions such as fog, except to mention that fog exists chiefly in certain latitudes and generally coincides with calm weather, or, at any rate, very light winds. Rain, snow, and hail I disregard, for they will be negligible to the planes of the future, though large hailstones may be harmful to propellers or even wings; but hailstorms are local, as a rule, and can be avoided. The ability also of aeroplanes to avoid or rise to a height above local disturbances will be the solution of many of these difficulties,

for heavy precipitation, generally speaking, arises in levels lower than 10,000 feet.

A GENERAL LAW FOR FLYING.

Applying the results of the Buys Ballot Law we arrive at another proposition, which will be accepted by meteorologists, that when the weather at any spot in the northern hemisphere is under the influence of low-pressure areas, and if the passage of the centres is near the place from which the pilot is flying westwards he will start on a northerly course at first. In like manner, when he desires to fly in an easterly direction he will take a southerly course to start with. If, on the other hand, the weather is under the influence of a high-pressure area, these rules will be exactly reversed. To give an illustration: If a large and intense anti-cyclone were to exist between England and the Alps, eastward-bound pilots would fly first of all over the North Sea and take a line eastwards through Western Russia, whereas, if westward bound from Egypt homewards, wise pilots would keep well to the south of the Alps before turning north to England.

There is another point which every experienced pilot is aware of, but which is not generally known to the public. The higher you fly the more the wind tends to turn to the right. That is to say, if on the ground you find a westerly wind, the wind at 5,000 feet will probably be W.N.W., and at 10,000 feet probably N.W. The cause of this is found in the rotation of the earth, but I cannot dilate on this here. I must also mention that isobars on the earth's surface are not the same, necessarily, as those several thousand feet up in the air.

Now I come to the conclusion of my lecture, and I desire to summarise the principal points.

THREE POINTS OF IMPORTANCE.

Firstly.—As soon as war is over there must be national and international laws for the regulation of flying.

Secondly.—Over-sea and over-continental routes must be defined in the interests of the whole world.

Thirdly.—The winds of the world, instead of being a drawback to flying over the surface of the planet, will, if properly used, prove to be of great assistance.

LIFE AND MONEY SPENT ON AVIATION NOT WASTED.

The progress of aviation, owing to its immense and increasing importance in the war for naval and military purposes, has been extraordinarily rapid during the last three years. The decisive military and naval results which a real preponderance of air power would bring about are at last beginning to be realised—I hope not too late. Nations are spending millions of money upon the development of flying, and thousands of brave men have sacrificed their lives, both in fighting and experimental work. There has been a prodigal expenditure of life and treasure and a wonderful concentration of brains and energy on aviation for destroying human life and wrecking property. But when peace once more comes, this output of human life and skill will prove not unproductive. Unlike the expenditure of all kinds in producing forts, battleships, guns, shells, powder, missiles, gas and horrible and ingenious ways of killing, resulting in nothing useful to the human race in future, the forced development of aviation will, perhaps, be the war's most useful legacy, apart from political effects, such as the welding together of the British Empire by the cement of blood.

And so I give you this thought to take home with you to-night, that the lives of our brave youth given to save us when our very existence is at stake, will not have been wasted. The great development of flying produced by this war will mean that in a few years from now the human race will navigate the air with ease, speed, and safety. And we who are alive to-day, and for a few years longer, should consider ourselves fortunate to be living in the most wonderful time in the world's history.

CONCLUSION.

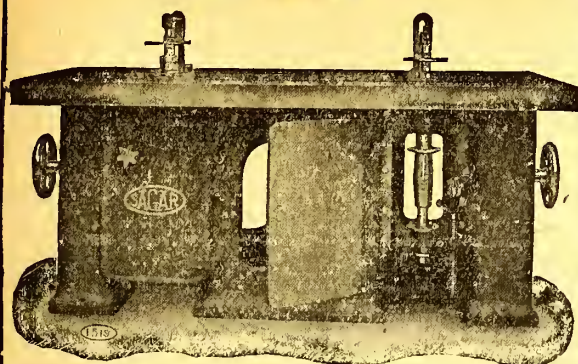
At the conclusion of the lecture Lord Sydenham, in proposing a vote of thanks to Lord Montagu, remarked how much the lecturer had given them to think about, especially in relation to meteorology. Our own meteorological system had been incomplete so far, and he hoped to see much more done.

As regards Lord Montagu's suggested aerial police force, he had his doubts about the success of a policeman who would be concerned with criminals mounted on machines doing 120 m.p.h. anywhere between 5,000 and 20,000 ft. along a 6,000 mile beat.

Referring to the general effect of aerial traffic on the development of the world, he expressed his opinion that, ultimately, it would have greater effect than the development of railways.

Sir Napier Shaw remarked that it was now 64 years since a Lieutenant in the United States Navy came to this country in the hopes of persuading people to find out, experimentally, the prevailing direction of the winds of the world with a view to reducing the times spent at sea.

The maps shown by Lord Montagu were based on those produced by this officer for his purpose. The general adoption of steamships, which neglected the direction of the wind, had caused the study of wind directions to fall into desuetude, but the new vehicles of the air would have again to pay attention to wind.



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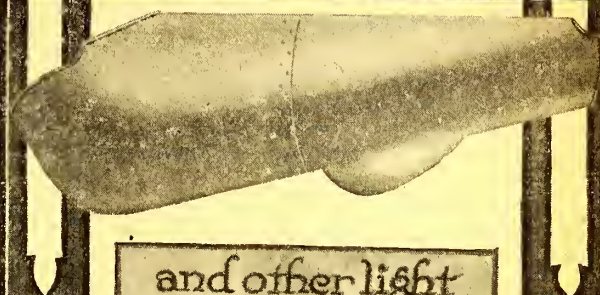
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A PIONEER PILOT.

His many friends in both Services and in the Aircraft Industry will regret to hear that Captain Gordon Bell has been invalidated out of the R.F.C. as being unfit for the arduousness of active-service flying. As one of the earliest of British aviators, Captain Bell will be well remembered as a pilot of the Avro, Hanriot, Martinsyde, Deperdussin, and Short machines. Up to the outbreak of war he must have held the record for the variety of types of machines flown by him, the number being well over 30, for, besides the machines mentioned above, which he flew regularly, he had flown, for the sake of the experience, practically every type in England and France.

For a while he was experimental pilot for M. Robert Esnault-Pelterie, and while flying a R.E.P. through its reception test by the Turkish Government, he had the distinction of being the first aviator to fly from Europe to Asia, the flight in question being from Constantinople, across the Bosphorus, over Asia Minor and back.

Happily, his invalidism is not sufficiently severe to prevent him from flying at home, so he is available as a test-pilot, and as such his vast experience should be of very high value to aircraft manufacturers in this country. Having flown the very latest high-speed scouts, as well as the older and slower machines, he is fully qualified to give an opinion on anything new that may be produced, and certainly no pilot is likely to surpass him, either in the pure skill of testing and experimental flying, or in the ability to criticise fluently whatever he may be testing. So many test pilots spoil themselves by endeavouring to please the maker of an aeroplane with kind words, when, perhaps, severe condemnation of certain defects would result in improvement, which would make the machine acceptable to the Flying Services instead of having it rejected. Captain Bell's habit of speaking his mind is a guarantee that when he tests a machine the designer will know all about it afterwards, and his experience of Service flying is an equally good guarantee that he will not help any maker to deceive himself into perpetuating a bad design.

Those who wish to communicate with Captain Bell can always find him by writing to the Royal Aero Club, 3, Clifford Street, W.1, and one hopes to hear soon that he is engaged on work worthy of his experience and ability.

LIKE FATHER LIKE SON.

The following paragraph from the "Isle of Wight Times" will please many who remember, with combined affection and amusement, the vehemence and driving force of the late Richard T. Gates:—

"A PLEASING INCIDENT—occurred at Brigstoeke Terrace on Tuesday, June 12th, at a juvenile party to celebrate the third anniversary of Richard Thomas Fairfax Gates. This vivacious little chap, whose grandfather had sent him a sovereign, mounted a chair at the request of his mother to thank the assembled guests—some thirty in number—for the bountiful supply of interesting toys, etc., they had bought him; and remarked that

the sovereign was to go to the fund being raised in Ryde for the sick and wounded soldiers from the front, at the same time vowing vengeance against the brutal Germans, whom he would like to shoot. This infant intellectual is the son of a late distinguished aviator in his day and generation, who lost his life in pursuit of science for King and Country, and whose fame and name will live in history. Therefore Science should keep its eye upon this promising child."

[If young Richard grows up to be as good a man as his father the world will be a better place, and the combination of charity to the unfortunate and ruthless severity towards the offenders seems to indicate that he is following in his father's footsteps. —C. G. G.]

MULLER v. WILLIAMS.

(Before Mr. Justice Coleridge and a Special Jury.)

On June 22nd Mr. Percy Maxwell Muller, manager in the aeroplane works of Vickers (Limited), at Weybridge, was awarded £300 damages in this libel action against Mrs. Louisa Elizabeth Williams and Mr. Thomas Mutlow Williams, of Greville Road, St. John's Wood, N.W. The defendants admitted the writing of the words complained of, and they offered an apology to the plaintiff.

Mr. Barrington-Ward, in opening the case, said that the only question for the jury was the amount to be paid to the plaintiff for the libel which had been published about him. A man could not help having a German name. If he changed it people said, "A leopard cannot change his spots." If he did not people called him a "wretched Hun." The plaintiff had no association whatever with Germany. He was a Scotsman and his father and grandfather were Scotsmen.



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NEWCASTLE-ON-TYNE—Collingwood Street.

KINDLY MENTION "THE AEROPLANE" WHEN CORRESPONDING WITH ADVERTISERS.

The plaintiff had been in the service of Vickers Ltd. for a number of years, and had been promoted to the position of manager of their aviation department. He had served in the South African War. His wife was British-born; her maiden name was Smith, and she had lived in England all her life.

On February 9th, 1917, Mrs. Williams wrote the following letter to the managing director of Vickers Ltd.:—

Dear Sir,—I am informed on excellent authority that one of the managers in one of your factories is a German named Muller, who lives with his wife, also a German, at ——. He is detested by your workmen, whom he bullies, and they say, "One day there will be an explosion, and then they will see."

I am a holder of 630 shares in Vickers, Sons, and Maxim. My husband also has shares, so I feel I have a right to make these inquiries, as it is shameful our Englishmen, whose sons and brothers are fighting for us, should be insulted by having a German over them, and a grave danger in works employed by the Government. I do not know if he is naturalised. If so, I beg to draw your attention to the speech by Mr. Joynson-Hicks at the Women's Imperial Defence meeting reported in this morning's papers:—"The best German from the enemy point of view is the German who appears to be the best Englishman." Naturalised Germans are traitors to their own country, and must be got rid of.

Counsel said that Mrs. Williams was an old lady, and it was a pity that she had not learned a little more sense. He explained that about 1820, when persons studied the use of the globe and learned music from professors, the plaintiff's grandfather, a Mr. Miller, went to Zurich, took some lessons, and, on his return, called himself "Professor Muller." (Laughter.)

The plaintiff, in evidence, said that he had been employed by Vickers Ltd. for four years and a half. His conduct at the works had never been complained of. Major Woods, his immediate superior, showed him Mrs. Williams's letter.

In cross-examination, the plaintiff said that the contents of the letter got circulated through the works. Notices which he put up were defaced, such words as "Bloody German" being written across them.

Mr. Colam, addressing the jury in mitigation of damages, said that the libel complained of was in a letter written by a lady of more than 70 years of age, who had made a mistake for which she had apologised, and had offered to do everything possible to make that apology public. A farthing damages was sufficient.

His Lordship having summed up, the jury returned a verdict for the plaintiff, assessing the damages at £300.

Judgment was entered accordingly, a stay of execution being refused.

A SEEMLY SPIRIT.

A bunch of flowers placed on the grave of the crew of the Zeppelin recently brought down in East Anglia bears the following inscription:—"These flowers are from an Englishman who understands that each of these souls is somebody's son."

THE PARLIAMENTARY AIR COMMITTEE.

Forty-eight Members of Parliament have joined the Parliamentary Air Committee during the past week. [Evidently the London Air Raid has not been without good effect.—Ed.]

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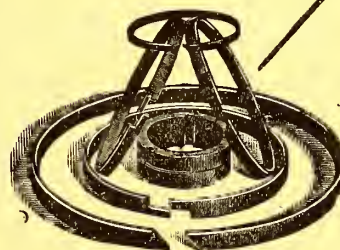
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	129	300							
300	300	501	2						
	6003								
	8293	500	9	15	35				
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	8294	501	9	12	25				
350	130		3	8	15				
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	8295	10005							
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